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1953 TESTS

Corn Hybrids and Varieties

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These corn tests are a cooperative project between the Mississippi Experiment Station and the Agricultural Research Service, U. S. Department of Agriculture.

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The plantation trial included in these tests was made possible through the cooperation of E. T. Shaffer, Yazoo City.

Corn Hybrids And Varieties --- 1953 Tests

1953 Tests in Mississippi[1]

Corn hybrids developed in the cooperative breeding programs of the State Agricultural Experiment Stations in cooperation with the United States Department of Agriculture led in all sections of the state in 1953. Promising new experimental hybrids were at the top of many tests excelling not only in yield but in erectness of plants at harvest.

The average yield of corn in Mississippi in 1953 was 21 bushels per acre in spite of one of the worst droughts in Mississippi. The average yield in the the state for the 10-year period 1935-44 was 15 bushels per acre. The ability of Mississippi farmers to grow 40% more corn per acre in 1953 compared to the relative normal years of 1935-44 is probably due to three major factors. The first is the increase in the use of adapted hybrid seed corn. During the 10-year period 1935-44, almost no adapted hybrid corn was available to the farmers of the state. In 1953, however, 44 percent of the Mississippi corn acreage was planted with hybrid corn.

Liberal use of nitrogen on many fields held the corn in a green vegetative condition until rains arrived. In former years, without the use of high rates of nitrogen and hybrids, the corn dried up and died when a drought occurred. The third factor was the elimination of many marginal acres which were taken out of corn and planted to pastures or other crops.

With more adapted hybrids being bred for the South, and with adequate stands and rates of fertilizers, Mississippi farmers should double or treble their 1953 yields in an average season.

The best guide to the desirability of a hybrid is its performance over a period of years. Based on their performance in the past several years as well as in 1953, the following hybrids are recommended for Mississippi:

1954 Hybrid Recommendations
North Mississippi (North of U. S. Highway 82)

Dixie 17 (white).
Dixie 33 (white).
Dixie 22 (yellow).
Pfister (PAG) 631 (white) early feed.
Funk G779W (white).
Funk G785W (white).

Central Mississippi
(North of U. S. Highway 80 and South of U. S. Highway 82)

Dixie 11 (white).
Dixie 18 (yellow).
Funk G785W (white)
Coker 811 (white)
Coker 911 (white).
Dixie 17 (white) early feed or early hogging off.
Dixie 33 (white) early feed or early hogging off.
Dixie 22 (yellow) early feed or early hogging off.
Pfister (PAG) 631 (white) early feed or early hogging off.
Funk G779W (white) early feed or early hogging off.

South Mississippi
(South of U. S. Highway 80)

Dixie 18 (yellow).
Coker 811 (white).
La. 521 (white).

Hybrids recommended for North Mississippi: use only for early feed or early hogging off.

The availability of planting seed has been considered in these recommendations; this automatically keeps an experimental hybrid from the list.

These tests, designed to measure the performance of corn hybrids and varieties, were planted at State College, eight of the branch stations, and two farms in the Delta. Drought at Clarksdale eliminated the test at that location. The seed was collected from planting seed being sold at seed stores. The seed of each Dixie hybrid was obtained from a composite of the seed obtained from all certified growers for laboratory analysis by Dr. A. D. Suttle, of State College, so that they are representative of the seed on the market.

All hybrids do not perform equally well. At the present time a few farmers are dissatisfied with corn hybrids because when purchasing the seed they did not specify a particular hybrid. Although there are a number of adapted hybrids better than the best adapted varieties, the Experiment Station has always recommended the use of an adapted hybrid or an adapted open pollinated variety in preference to a poor unadapted hybrid which not only gives low yield but often has poor quality grain, and practically no insect resistance.

Explanation of Tables

The state was divided into 3 sections, North Mississippi, Central Mississippi, and South Mississippi. Holly Springs, Pontotoc, Verona, State College and Stoneville were placed in the northern section; Brooksville, Newton, Raymond and Yazoo City in the central section and Poplarville in the southern section. Within a section most entries were the same. The placing of corn hybrids in one of the sections was done on the recommendation of the breeder. The entries were randomized with 5 replications in each test except Poplarville which had 6. Each plot was two rows wide and ten hills long with rows and hills 40" apart (42" at Brooksville and Poplarville, and 38" at Yazoo City.

Five seeds were planted per hill and thinned to two or three plants. Tests at Holly Springs, Pontotoc, Newton, Raymond and Poplarville were thinned to two stalks per hill which with a perfect stand resulted in about 7800 plants per acre. Tests at State College, Stoneville, Brooksville, Yazoo City and Verona were thinned to three plants per hill which resulted in a perfect stand of about 12,000 plants per acre.

In seven of the ten tests field weights of ear corn were converted into weights of shelled corn by multiplying by the shelling percent. These weights were then adjusted to 15.5% moisture content of the grain and converted to bushels per acre. In three tests moisture content of the grain was not taken so that acre yields are based on 66 pounds of ear corn per bushel.

Lengthy drought periods seriously affected the yield of a majority of the tests. The lack of moisture preceding harvest is reflected in the generally high percentage of sound ears.

The percentage of plants lodged is based on actual counts. All plants broken below the top ear-bearing node (joint) were classified as stalk lodged while all plants leaning 30 degrees or more were root lodged.

Ears infested with rice weevil and corn earworms are shown and percent of the damage is given in a rating. Rice weevil damage was so slight that a measure of resistance could be obtained only at Poplarville. Data on earworm infestation are reported from 8 locations. Ear height is reported as the distance in feet from the ground to the point where the top ear is attached to the plant. Ears per plant indicate whether the hybrid is one-eared or prolific; it is obtained by dividing the number of ears harvested by the total number of plants. Husk length is reported in the number of inches that the husk extends beyond the tip of the ear.

The shelling percentage is a measure of the ratio of grain to cob in a sample of ear corn. A shelling percentage of 85 means that in 100 pounds of ear corn. 85 pounds are grain and 15 pounds are cobs. Generally speaking prolific hybrids have more grain and less cob than do one-eared hybrids.

No hybrid is recommended on the bassis of one year's test; testing for at least two years is necessary for recommendation.

North Mississippi

The tests at State College, Verona, and Stoneville were the three highest yielding tests in 1953. The tests at Pontotoc and Holly Springs were seriously affected by the drought and at both stations the early hybrids yielded relatively better than they did in the higher yielding tests at State College, Verona, and Stoneville.

The averages of the data for the five tests in North Mississippi are shown in Table 1 and the individual tests in Tables 2-6. The nine highest yielding hybrids were developed by the U. S. Department of Agriculture in cooperation with the Southern Agricultural Experiment Stations. Four of these hybrids are new experimental hybrids while five are Dixie hybrids. Seed is available of the Dixie hybrids for planting. It may be from 1 to 4 years before planting seed is available for the experimental hybrids.

The highest yielding commercial hybrid was Dixie 33 (white) followed closely by Dixie 22 (yellow). Dixie 11 and Dixie 17 were next in order of yield. Dixie 33 and Dixie 17 are both white and have one single cross parent in common, so that the seed purchased by farmers looks exactly the same. Dixie 33 has less lodged plants than Dixie 17 but the grain is of poorer quality.

Dixie 22 is a yellow hybrid adapted to the northern one-third to one-half of Mississippi. It stands well and has about the same ear size as Dixie 33. It has performed well over a period of years and is growing in popularity.

Funk G779W and Funk G785W have been tested for several years and can be recommended for northern Mississippi. Both hybrids have white grain. Funk G779W is the better yielding hybrid, but Funk G785W has a much better husk protection. These two Funk hybrids yielded satisfactorily at all locations except Pontotoc where poor seed set, possibly caused by the heat and drought, reduced yields, especially with Funk G785W. Funk G721 and G711 both lodged badly, and G721 was low in yield.

Pfister (PAG) 631 performed poorly in 1953 compared with previous years. It is a low-eared hybrid with white grain of rather poor quality. It is recommended on the basis that is one of the earliest hybrids adapted to Mississippi and can be used for early feed or hogging off. Pfister (PAG) 655 was erratic in performance. It yielded well at Verona and State College, but poorly at Stoneville and Pontotoc.

McCurdy 1001A appears to be the best McCurdy hybrid for North Mississippi. This is the first year this hybrid has been tested.

Central Mississippi

The 4-station averages of the tests in Central Mississippi are shown in Table 7 and the individual tests in Tables 8-11. The eleven highest yielding hybrids (Table 7) were developed by the U. S. Department of Agriculture-Agricultural Experiment Station cooperative program. Four of these are Dixie hybrids while seven are experimental hybrids.

Dixie 11 is a white hybrid with excellent quality grain. It is susceptible to root lodging which is undesirable when the corn is to be harvested with a mechanical corn picker. Dixie 11 has a medium husk and is moderately resistant to rice weevil, but it is relatively resistant to the corn earworm.

The two hybrids most resistant to rice weevils and carrying good earworm resistance are Dixie 18 and Coker 811 but these do not yield as much as some of the other hybrids. Both have excellent lodging resistance and grain quality and are recommended where lodging resistance and weevil resistance is desired. Coker 811 is lower-eared than Dixie 18.

Funk G785W has performed well over a period of years. This white hybrid yields well, has a fairly good husk for Central Mississippi and stands well at harvest. Funk G714A and G721 lodge badly and are only medium in yield so cannot be recommended. A new Funk experimental hybrid, Funk Exp. 24007 tested for the first time in 1953, stood well and had medium yield.

Coker 911 stands well and has excellent quality grain. It is lower eared than most southern hybrids. It can be recommended for those areas where rice weevils are not serious. The McCurdy hybrids 1002A and 1003 were low in yield and cannot be recommended. McCurdy 1005W1 is similar in plant type to Dixie 17 but yielded much less and lodged more. McCurdy 1005W1 cannot be recommended in Central Mississippi.

Three late maturing experimental hybrids, Mississippi 1125, Mississippi 2113, and Mississippi 2117 were grown in the Central Mississippi tests. In the two highest yielding tests at Brooksville and Yazoo City, Mississippi 1125 was excellent in yield and lodging resistance. In the two low yielding tests at Newton and Raymond, Mississippi 1125 was very low in yield. It appears that on fertile soils supplied with adequate water, Mississippi 1125 may be valuable as a grain or a silage corn.

South Mississippi

The corn planted in South Mississippi at the regular planting time was badly hurt by the drought while late planted corn caught rains in time to produce good yields. The test at Poplarville suffered severely from heat and drought. There was no significant difference in yields among the varieties so that the average yield for the 3-year period 1950-52 should be used. Little or no confidence can be placed to the 1953 yields (Table 12).

On the basis of the tests over a period of years, Dixie 18, a yellow hybrid and Coker 811, a white hybrid, can be recommended because of their yield, resistance to lodging and resistance to the rice weevil. Although excellent in yield Dixie 11 lodged badly and is susceptible to rice weevils. With the exception of Funk Exp. 24006 (Y), the Funk hybrids had a high percent of stalk breaking. Mississippi 1125 (experimental) yielded well and was relatively resistant to rice weevils. Mississippi 1125 is a late maturing large-eared white hybrid that has promise both as a grain and silage hybrid.

Louisiana hybrid 521 has good rice weevil resistance and yields well. It is rather poor on lodging resistance but can be recommended in South Mississippi. La. 521 was not included in the 1953 tests

Table 1. Average of data from hybrid corn tests grown at Holly Springs, Verona, State College, Pontotoc, and Stoneville. 1953.

Pedigree	Acre Yeld 1953	3-year average 1951-53	Plants erect at harvest	Lodging		Ear-worm[1]	Ear ht.	Ears per plant	Husk		Shell-ing	Moist in grain[4]	Stand
				Root	Stalk				Length[2]	Tightness[3]			
	bu.		%	%	%	%	ft.	No.	in.	grade	%	%	%
T2573	72.2		81	13	6	89	3.4	1.3	2.0	0.6	84.2	11.0	96
Dixie 33	71.2	68.4	78	17	5	87	3.8	1.2	1.8	1.1	85.0	10.7	95
Miss. 1123	70.1		90	8	2	70	3.8	1.4	3.3	2.4	81.7	11.7	96
Dixie 22	70.0	63.8	85	11	4	74	3.8	1.1	2.6	1.9	83.1	11.6	94
Tenn. 29	69.7		89	8	3	90	3.3	1.2	2.0	0.6	84.0	11.6	95
Dixie 11	69.4	64.4	69	25	6	65	4.1	1.5	2.9	2.4	86.2	11.9	96
Dixie 17	68.2	64.3	71	21	8	81	3.6	1.4	2.3	1.5	85.1	11.0	95
Miss. 3137	66.6		87	10	3	77	4.2	1.1	2.4	1.6	83.7	11.5	94
Dixie 82	66.1		82	13	5	71	4.2	1.4	3.5	2.3	81.7	11.8	94
Funk G779W	64.6		81	13	6	90	3.5	1.2	1.0	0.1	83.7	11.8	92
Pfister (PAG) 655	62.8		92	6	2	82	3.9	1.2	2.4	1.6	83.6	11.5	96
Funk G785W	62.3	61.0	82	14	4	77	3.9	1.4	2.1	2.2	83.3	11.5	97
McCurdy 1001A	62.0		85	10	5	73	3.7	1.2	2.0	1.1	83.2	11.5	94
McCurdy 1005W1	61.2		67	20	13	83	3.5	1.3	1.6	0.8	85.4	10.9	92
Funk G711	60.4		73	9	18	92	3.2	1.0	1.0	0.1	82.9	11.7	94
Pfister (PAG) 636	59.8		75	20	5	94	3.1	1.2	1.6	0.6	83.7	10.8	93
Pfister (PAG) 631	59.7	60.8	68	24	8	94	2.6	1.0	2.2	1.3	82.2	10.5	95
Coker 911	58.9		88	10	2	76	3.2	1.2	1.8	1.3	84.1	11.6	94
Pfister (PAG) 486	58.0		88	5	7	78	3.1	1.3	2.1	1.7	87.1	11.8	92
McCurdy 1000A	56.8		82	13	5	85	3.5	1.0	3.1	2.0	83.3	10.8	91
Funk G721	56.6		71	16	13	77	3.4	1.0	2.2	1.8	84.2	11.4	91
*Station Mosby	55.3	51.2	72	19	9	75	4.7	1.1	1.9	1.3	82.8	11.4	95
*Jellicorse	52.7	53.5	81	11	8	86	3.1	1.1	1.8	0.7	81.4	10.6	93
*Jarvis	49.6		69	13	18	86	2.9	1.3	2.2	1.6	87.7	11.2	90

[1] Two station average.
[2] Three station average.
[3] Two station average.
[4] Four station average.

*Open pollinated varieties.

Table 2. Main hybrid corn test, Holly Springs, Mississippi, 1953.

Entry	Acre yield 1953	Acre yield 2-year average 1951 and 1953	Plants erect at Harvest	Lodging Root	Lodging Stalk	Ears infested Earworm	Ear Ht.	Ears per plant	Husk length	Shell-ing	Moist in Grain	Stand
	bu.	bu.	%	%	%	%	ft.	no.	in.	%	%	%
T2573	49.2		98	0	2	96	3.8	1.6	2.6	82.1	10.1	93
Dixie 17	47.4	42.9	87	1	12	93	4.0	1.6	3.0	83.4	10.5	93
Pfister (P.A.G.) 631	46.7	43.8	90	2	8	93	3.0	1.1	2.4	82.0	9.6	97
Dixie 33	45.8	46.0	98	1	1	96	4.2	1.3	2.4	83.1	10.2	91
Keystone 107W	45.8		99	0	1	99	3.0	1.2	1.8	83.8	9.2	93
Pfister (P.A.G.) 636	45.2		96	1	3	98	3.0	1.3	2.0	82.0	9.6	94
Tenn. 29	44.7		100	0	0	95	3.8	1.4	3.4	82.0	10.2	90
McCurdy 1005-W1	44.0		90	2	8	95	3.8	1.5	2.0	83.9	10.2	81
Miss. 3137	43.8		100	0	0	91	4.8	1.2	3.0	82.6	10.5	96
Pfister (P.A.G.) 486	41.6		93	1	6	89	3.0	1.5	2.4	85.0	11.1	82
*Jarvis	41.5		75	4	21	92	3.0	1.6	2.4	85.9	11.1	87
Funk G711	41.3		74	2	24	94	3.2	1.1	1.4	82.1	11.2	91
Pfister (P.A.G.) 655	41.3		99	1	0	96	4.0	1.3	2.6	83.2	10.9	90
McCurdy 1001A	40.8		95	0	5	87	4.2	1.4	2.6	82.3	11.1	92
Coker's 911	40.6		99	0	1	84	3.0	1.5	2.0	81.9	9.6	88
McCurdy 1000-A	40.6		95	0	5	94	4.0	1.1	3.0	82.2	9.8	92
Funk G779W	39.8		94	2	4	97	4.0	1.3	2.0	82.8	10.9	93
Dixie 82	39.7		99	0	1	85	5.0	1.4	3.8	81.1	11.6	95
Dixie 11	39.2	34.5	92	5	3	86	5.0	1.6	3.0	84.6	11.6	97
Miss. 1123	38.8		99	0	1	93	4.0	1.4	3.2	78.9	10.5	95
Funk G785W	38.3	34.4	93	2	5	90	4.6	1.6	2.4	82.7	10.9	93
Dixie 22	38.1	35.0	95	1	4	91	4.0	1.2	2.6	81.1	11.4	96
*Jellicorse	37.8	34.8	96	1	3	96	3.2	1.3	2.0	79.2	9.4	91
*Funk G721	35.3		83	0	17	92	3.8	1.1	2.6	82.7	10.9	93
*Station Mosby	32.4	28.2	93	2	5	82	5.4	1.1	2.6	81.5	10.7	93

A difference in yield of at least 6.9 bushels per acre is required to be considered significant.

*Open pollinated varieties.

Table 3. Main hybrid test, Verona, Mississippi, 1953.

Entry	Acre yield 1953	Acre yield 3-year average 1951-53	Plants erect at harvest	Lodging Root	Lodging Stalk	Ear ht.	Ears per plant	Shell-ing	Moist in grain	Stand
	bu.	bu.	%	%	%	ft.	no.	%	%	%
T2573	96.2		80	7	13	3.6	1.4	86.0	12.8	95
Miss. 3137	94.3		88	5	7	4.5	1.2	85.0	14.6	92
Dixie 33	91.6	83.2	81	6	13	4.0	1.3	86.5	12.8	93
Miss. 1123	89.3		92	4	4	4.0	1.5	83.4	14.3	94
Tenn. 29	88.9		90	5	5	3.2	1.2	85.1	14.9	94
Funk G779W	88.7		85	6	9	4.0	1.3	85.6	14.4	95
Funk G785W	85.5	78.8	94	3	3	4.2	1.6	86.3	13.6	97
Pfister (P.A.G.) 655	83.6		97	1	2	4.0	1.2	85.5	13.6	96
Dixie 11	83.4	78.5	81	9	10	4.2	1.5	86.8	14.0	96
Dixie 82	83.1		85	6	9	4.0	1.4	83.0	13.6	92
McCurdy 1001A	82.7		91	1	8	4.2	1.3	84.5	13.1	94
Coker's 911	81.4		94	3	3	3.4	1.2	85.4	14.6	98
Pfister (P.A.G.) 631	80.8	76.2	82	3	15	2.8	1.1	83.8	11.7	93
Keystone 107W	80.7		92	1	7	3.0	1.0	86.5	11.4	93
Pfister (P.A.G.) 636	79.2		88	4	8	3.0	1.3	84.2	12.5	88
Dixie 22	78.4	74.9	94	2	4	4.0	1.1	84.1	13.5	95
Dixie 17	77.4	72.3	83	7	10	3.6	1.3	85.6	12.8	93
*Bells Pride	76.8		73	11	16	5.6	1.1	85.5	12.8	94
Funk G711	75.2		77	4	19	3.2	1.0	84.5	14.6	91
McCurdy 1000-A	75.1		89	5	6	3.8	1.0	84.3	12.5	92
Funk G721	71.3		78	10	12	3.4	1.1	84.7	13.0	87
Pfister (P.A.G.) 486	70.5		89	2	9	3.0	1.2	88.2	13.5	92
*Station Mosby	70.3	64.4	77	8	15	5.0	1.1	83.9	14.0	94
McCurdy 1005-W1	69.8		65	10	25	3.8	1.2	86.4	12.7	93
*Jellicorse	66.6	67.7	86	3	11	3.0	1.2	82.9	12.8	93
*Jarvis	56.8		61	11	28	2.8	1.4	88.8	12.4	86
*Spears	32.6		81	7	12	6.0	0	77.8	14.8	85

A difference in yield of at least 10.4 bushels per acre is required to be considered significant.

*Open pollinated varieties.

Table 4. Main hybrid corn test, State College, Mississippi, 1953.

Entry	Acre yield		Plant erect at harvest	Lodging		Ears infested ear-worm	Ear ht.	Ears per plant	Husk		Shell-ing	Moist in grain	Stand	Wilt-ing[1]
	1953	3-year average 1951-1953		Root	Stalk				Length	Tight-ness				
	bu.	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%	grade
Miss. 1123	105.4		92	6	2	48	3.6	1.4	3.0	2.8	85.2	11.4	99	0.8
Dixie 82	100.9		86	7	7	57	3.6	1.5	3.0	2.4	84.2	11.7	98	1.8
Dixie 11	98.6	90.5	53	40	7	45	3.4	1.6	2.6	2.2	88.2	11.7	99	1.2
Dixie 17	97.8	89.0	69	20	11	70	3.0	1.5	1.8	1.8	87.2	10.6	99	2.2
Miss. 3137	97.7		85	10	5	64	3.2	1.1	2.0	2.0	87.0	11.0	97	1.8
Dixie 33	94.8	93.2	65	30	5	79	3.0	1.1	1.4	1.2	87.0	10.6	99	1.4
McCurdy 1001A	94.3		83	10	7	60	3.0	1.3	1.6	1.0	85.7	11.5	99	1.4
Pfister (P.A.G.) 655	93.6		89	8	3	68	3.4	1.2	2.0	1.6	87.4	11.2	97	2.0
Dixie 22	90.3	84.1	73	20	7	58	3.2	1.1	2.6	1.8	85.1	11.2	98	1.8
Funk G779W	90.2		70	20	10	84	3.0	1.1	1.0	0.2	86.8	11.5	96	1.4
T2573	90.0		52	41	7	82	2.8	1.2	1.6	1.0	86.7	11.0	100	1.0
Funk G785W	89.3	85.5	83	10	7	65	3.0	1.3	1.8	1.8	87.1	11.5	99	1.2
Tenn. 29	88.0		73	22	5	86	2.8	1.0	1.0	1.0	85.7	10.6	98	0.2
*Station Mosby	83.4	76.3	70	21	9	69	3.8	1.1	1.4	1.4	85.1	11.0	98	2.6
Funk G711	81.9		58	20	22	91	3.0	1.1	1.0	0	85.5	10.6	98	0.2
Coker's 911	80.6		91	7	2	68	2.8	1.1	1.8	1.6	86.9	11.7	96	2.0
McCurdy 1005-W1	80.2		47	40	12	72	3.0	1.4	1.0	1.0	87.0	10.4	97	1.8
Pfister (P.A.G.) 486	78.9		79	9	12	67	3.0	1.1	2.0	1.8	89.0	11.8	98	1.4
Funk G721	76.0		57	30	13	63	3.0	1.0	2.0	2.0	86.5	11.2	95	0.6
*Jellicorse	74.5	73.0	62	29	9	76	3.0	1.1	1.6	0.8	83.8	10.8	98	1.6
Pfister (P.A.G.) 636	73.2		54	41	5	90	3.0	1.1	1.0	1.0	85.4	10.6	97	2.0
McCurdy 1000-A	73.0		75	20	5	76	3.0	1.0	3.0	2.0	85.0	10.8	94	1.0
Keystone 107W	69.2		39	57	4	97	2.8	1.0	1.4	1.0	87.0	10.2	96	1.4
Pfister (P.A.G.) 631	64.1	77.6	14	80	6	95	2.2	1.0	2.2	1.6	83.6	10.3	98	0.8
*Jarvis	62.0		55	28	17	80	2.6	1.2	1.4	1.2	89.3	11.2	98	2.8

A difference in yield of at least 5.2 bushels per acre is required to be considered significant.

*Open pollinated varieties.

[1] 0 = No wilting; 3 = severe wilting, on June 18.

Table 5. Main hybrid test at Pontotoc, Mississippi, 1953. (Pontotoc Ridge)

Entry	Acre yield		Plants erect at harvest	Lodging		Ear ht.	Ears per plant	Shelling	Moist in grain	Stand
	1953	2-year average 1952-53		Root	Stalk					
	bu.	bu.	%	%	%	ft.	no.	%	%	%
Tenn. 29	44.3	36.9	92	4	4	3.0	1.1	83.0	10.6	96
Dixie 22	44.1	32.4	97	2	1	3.6	1.1	82.4	10.2	92
Dixie 17	43.0	33.6	94	3	3	3.2	1.3	84.4	10.2	98
Dixie 11	41.4	30.4	81	11	8	3.8	1.5	84.4	10.2	98
McCurdy 1005-W1	40.4		85	6	9	3.2	1.1	84.5	10.2	95
McCurdy 1000A	40.0		94	5	1	3.2	1.0	82.3	10.0	92
Dixie 33	40.0	33.8	90	7	3	3.8	1.1	83.4	9.4	96
Keystone 107W	38.5		74	24	2	3.0	1.0	85.3	9.8	94
T2573	38.3		88	7	5	3.0	1.1	81.4	10.2	99
Pfister (P.A.G.) 631	37.4	32.0	77	22	1	2.0	1.0	79.4	10.4	93
Pfister (P.A.G.) 636	36.8		83	12	5	2.8	1.1	82.7	10.4	96
Dixie 82	36.6	28.9	92	3	5	3.8	1.4	78.4	10.4	94
Coker's 911	34.6	27.9	97	3	0	3.0	1.1	82.4	10.6	98
Funk G721	34.3	27.3	76	6	18	3.0	1.0	83.1	10.6	90
Miss. 3137	34.2		94	3	3	3.8	1.1	79.7	10.0	91
Miss. 1123	33.7	29.4	95	3	2	3.6	1.3	77.8	10.6	96
Pfister (P.A.G.) 486	33.4	27.4	93	3	4	3.0	1.0	86.3	11.0	95
Funk G711	32.4	27.9	89	3	8	3.2	1.0	78.2	10.6	96
Funk G779W	32.2	27.7	94	3	3	3.0	1.3	78.3	10.4	97
McCurdy 1001A	30.1		96	0	4	3.0	1.1	80.5	10.4	92
*Jellicorse	30.1	26.2	91	3	6	3.0	1.0	79.3	9.4	97
Pfister (P.A.G.) 655	27.4	22.2	96	3	1	3.8	1.3	77.7	10.4	98
*Jarvis	27.1	19.6	85	3	12	2.8	1.0	86.4	10.2	91
*Station Mosby	26.9	19.5	84	6	10	4.0	1.1	80.6	10.0	95
Funk G785W	22.7		91	6	3	3.2	1.4	74.3	10.0	97

A difference in yield of at least 8.0 bushels per acre is required to be considered significant.

*Open pollinated varieties.

Table 6. Main hybrid corn test, Stoneville, Mississippi, 1953.

Entry	Acre yield		Plants erect at harvest	Lodging		Ear-worm damage	Ear ht.	Ears per plant	Husk[2]		Shell-ing	Un-sound ears	Ear[3] direc-tion	Stand	Ear[4] appear-ance
	1953	3-year average 1951-53		Root	Stalk				length	tight-ness					
	bu.	bu.	%	%	%	score[1]	ft.	no.	in.	score	%	%		%	score
Tenn. 2573	87.3		86	12	2	2.8	3.8	1.2	1.7	.3	85	6	3.0	95	3
Dixie 11	84.6	83.9	35	61	4	1.2	4.1	1.5	3.0	2.7	87	1	2.7	88	1
Dixie 33	83.6	85.3	60	39	1	3.2	4.1	1.1	1.7	1.0	85	7	3.0	97	3
Miss. 1123	83.5		71	27	2	1.6	3.9	1.2	3.7	2.0	83	4	2.0	95	2
Tenn. 29	82.8		91	8	1	3.4	3.6	1.0	1.7	.3	84	11	3.0	98	3
Funk G 785W	75.8		48	48	4	1.6	4.4	1.2	2.0	2.7	86	4	3.0	97	2
Dixie 17	75.3		23	74	3	2.8	4.0	1.2	2.0	1.3	85	5	3.0	93	3
Funk G 779W	72.0		62	32	6	3.6	3.6	1.1	.0	.0	85	9	2.3	81	3
McCurdy 1005W1	71.7		49	41	10	3.6	3.8	1.2	1.7	.7	85	7	3.0	94	4
Funk G 711	71.0		68	16	16	3.8	3.6	.9	.7	.3	84	9	3.0	94	3
Dixie 82	70.3		47	50	3	1.0	4.5	1.2	3.7	2.3	82	3	2.0	92	3
Pfister (PAG) 631	69.3	70.3	78	12	10	3.9	3.2	1.0	2.0	1.0	82	13	3.0	95	3
Dixie 22	69.0	77.8	67	30	3	2.0	4.3	1.1	2.7	2.0	83	4	2.3	90	2
Pfister (PAG) 655	68.3		79	19	2	2.5	4.4	.9	2.7	1.7	84	6	3.0	100	3
Funk G 721	66.3		58	35	7	2.2	3.7	1.0	2.0	1.7	84	6	3.0	88	3
Pfister (PAG) 486	65.4		86	11	3	1.7	3.7	1.0	2.0	1.7	87	4	3.0	93	2
Pfister (PAG) 636	64.7		54	42	4	2.8	3.5	1.1	1.7	.3	84	10	3.0	89	3
*Station Mosby	63.7	65.1	40	56	4	2.7	5.1	.9	1.7	1.3	83	7	2.7	96	3
Miss. 3137	63.2		64	34	2	2.8	4.6	.9	2.3	1.3	84	9	3.0	95	4
McCurdy 1001A	62.3		60	37	3	1.8	4.0	1.0	1.7	1.3	83	5	2.3	91	3
*Jarvis	60.7		68	20	12	1.8	3.4	1.2	2.7	2.0	88	7	3.0	87	2
Coker 811	58.3	67.2	62	36	2	1.0	3.9	1.2	2.3	2.7	83	2	3.0	89	3
Funk G 714A	57.7		47	43	10	1.7	4.0	1.1	3.3	2.0	84	3	3.0	79	2
Coker 911	57.3		57	39	4	2.0	3.6	1.0	1.7	1.0	84	3	3.0	90	2
Dixie 18	55.4	69.0	52	38	10	1.3	5.0	1.1	4.0	2.3	84	1	3.0	95	1
McCurdy 1000A	55.2		61	33	6	2.1	3.7	.8	3.3	2.0	83	7	2.3	86	3
*Jellicorse	54.5	64.3	73	17	10	3.2	3.4	1.0	1.7	.7	82	11	3.0	88	4

A difference in yield of at least 13.5 bushels per acre is required to be considered significant. *Open pollinated varieties.

[1] Earworm damage: 0 = none, 4 = severe damage.

[2] Husk data on 3 replications.

[3] Ear direction: 1 = ears up, 3 = ears down at harvst.

[4] Ear appearance: 1 = good, 4 = poor.

Table 7. Average of data from hybrid corn tests grown at Brooksville, Newton, Raymond, and Yazoo City, 1953.

Pedigree	Acre yield		Plants erect at harvest	Lodging		Ear-worm[1]	Ear ht.	Ears per plant	Husk[1]		Shell-ing[1]	Stand
	1953	3-year ave. 1951-53		Root	Stalk				Length	Tight-ness		
	bu.	bu.	%	%	%	%	ft.	no.	in.	grade	%	%
Miss. 3208	60.9		97	1	2	80	3.5	1.1	2.5	2.3	82.2	97
Miss. 3204	59.8		97	0	3	82	3.6	1.1	3.1	2.5	80.9	95
Miss. 3226	59.7		96	1	3	77	3.4	1.1	2.9	2.5	81.4	96
Dixie 17	59.3	49.6	89	2	9	84	3.2	1.2	1.7	1.7	86.2	95
Dixie 82	57.9		95	1	4	78	3.6	1.1	2.6	2.3	81.9	94
Miss. 3222	53.9		97	1	2	78	3.5	1.0	3.1	2.7	81.4	95
Miss. 1123	53.5		98	1	1	69	3.6	1.1	2.8	2.2	82.1	95
Miss. 2004	52.8		99	0	1	80	3.6	1.0	2.9	2.2	82.0	95
Dixie 11	52.5	44.2	87	7	6	75	3.5	1.2	2.5	2.4	86.3	91
Miss. 2006	51.2		99	0	1	84	3.5	1.0	2.6	2.3	81.1	94
Pfister (PAG) 486[2]	50.4		92	2	6	82	3.3	1.0	2.1	1.7	87.8	94
Dixie 22	49.6	42.7	95	2	3	86	3.5	1.0	2.0	1.6	82.4	92
Coker 911	49.5		98	1	1	83	3.0	1.0	1.8	2.0	85.0	92
McCurdy 1005W1	49.2		82	6	12	87	3.2	1.0	1.7	1.6	85.7	85
Miss. 1216	48.8		95	1	4	78	3.3	1.2	3.1	2.3	83.6	91
Funk G785W	48.1	40.3	93	3	4	84	3.5	1.1	1.8	1.7	83.9	97
Miss. 2020	48.1		99	0	1	85	3.4	1.0	3.1	2.9	80.0	91
Funk Exp. 24007	47.4		93	3	4	86	3.7	1.0	2.1	1.7	80.3	94
Miss. 1125	47.2		97	1	2	92	4.2	1.0	3.3	2.7	75.0	94
Funk G721	46.9		84	4	12	79	3.2	1.0	2.0	2.1	84.4	87
Dixie 18	46.5	39.0	95	1	4	70	4.0	1.0	3.3	2.9	83.5	93
Miss. 2018	46.2		99	0	1	83	3.6	1.0	3.3	2.9	77.2	92
Miss. 2113	43.4		97	1	2	89	4.0	1.0	3.1	2.7	76.0	88
*Station Mosby	43.0	35.5	81	7	12	87	4.1	1.0	2.1	1.6	81.7	91
Coker 811	42.5	37.3	97	1	2	80	3.1	1.0	2.0	1.9	82.0	93
Funk G714A	40.8	36.3	89	3	8	80	3.1	1.0	2.6	2.3	83.0	93
McCurdy 1003	40.3		96	2	2	76	3.2	1.0	2.9	2.0	83.7	87
Miss. 2117	39.4		97	1	2	94	4.0	1.0	2.7	2.5	76.0	85
McCurdy 1002A	38.3		93	3	4	82	3.4	1.0	2.1	2.0	79.9	88

[2] Adjusted three station average.

*Open pollinated varieties.

Table 8 Main hybrid corn test, Brooksville, Mississippi, 1953.

Entry	Acre yield		Plants erect at harvest	Lodging		Ears Infested earworm	Ear ht.	Ears per plant	Husk		Shelling	Moist. in grain	Stand
	1953	2-year ave. 1952-53		Root	Stalk				Length	Tightness			
	bu.	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Dixie 82	73.0	48.3	95	0	5	79	4.2	1.2	2.6	2.2	83.1	11.6	99
Miss. 3226	72.1		97	1	2	76	4.0	1.2	3.2	2.8	81.7	11.8	98
Miss. 3208	70.8		96	1	3	82	4.0	1.2	2.8	2.6	82.3	11.3	99
Dixie 17	69.3	46.6	93	0	7	83	3.8	1.2	2.0	2.0	86.3	11.0	96
Miss. 3204	68.6		96	0	4	85	4.2	1.2	3.8	2.8	82.4	11.3	92
Miss. 1125	65.2		93	1	6	88	4.6	1.0	3.8	3.0	83.3	11.8	96
Dixie 22	64.4	49.0	97	1	2	88	4.2	1.1	2.0	1.4	83.0	11.6	95
Miss. 2113	63.7		96	2	2	82	4.6	1.0	3.4	2.6	84.0	11.6	97
Miss. 1123	63.5	45.6	99	0	1	74	4.2	1.2	3.0	2.6	82.2	11.4	100
Dixie 11	62.4	41.6	75	10	15	80	4.2	1.4	3.0	3.0	86.0	11.3	99
Miss. 2117	61.4		95	1	4	89	4.6	1.0	3.0	2.6	82.6	11.3	96
Miss. 2006	61.4		98	0	2	87	4.0	1.2	2.8	2.0	82.1	11.4	98
McCurdy 1005W1	60.9		79	5	16	85	3.6	1.2	2.0	1.8	85.8	11.0	98
Miss. 3222	59.2		96	1	3	77	4.0	1.1	3.2	2.8	81.3	11.8	97
Miss. 2004	58.2		100	0	0	84	4.0	1.0	2.8	2.2	81.7	11.4	97
Coker's 911	56.2	40.8	97	1	2	93	3.4	1.0	1.8	1.8	85.0	11.3	93
Pfister (PAG) 486	55.9	42.4	93	0	7	88	3.8	1.0	2.2	1.8	87.9	11.6	99
Funk G785W	55.0	35.3	93	1	6	85	4.0	1.3	2.0	1.6	83.9	11.3	98
Miss. 1216	54.9		97	0	3	75	4.0	1.7	3.6	3.0	83.6	11.8	97
Miss. 2020	53.7		97	0	3	89	4.0	1.0	3.2	2.8	81.7	11.3	95
Funk G721	53.6	39.0	82	1	17	82	3.6	1.0	1.8	1.8	84.2	11.2	95
Funk Exp. 24007	53.4		90	3	7	86	4.6	1.0	2.0	2.0	80.8	11.0	95
*Station Mosby	51.7	31.6	66	7	27	85	4.4	1.1	2.2	1.4	82.7	11.3	98
Dixie 18	49.0	32.0	93	0	7	73	4.8	1.1	3.6	3.0	82.9	11.3	99
Funk G714A	48.5	30.9	84	1	15	81	3.2	1.1	3.0	2.8	84.1	11.4	95
McCurdy 1002A	44.4		92	3	5	84	4.0	1.0	2.0	2.0	79.9	11.3	99
Coker's 811	44.2	31.8	99	0	1	86	3.4	1.1	2.2	2.2	82.8	11.8	96
Miss. 2018	43.8		99	0	1	84	4.2	1.0	3.6	3.0	75.0	10.8	94
McCurdy 1003	42.5		95	3	2	74	3.8	1.0	3.2	2.8	84.1	11.1	99

A difference in yield of at least 8.5 bushels per acre is required to be considered significant.

*Open pollinated varieties.

Table 9. Main hybrid corn test, Newton, Mississippi, 1953.

Entry	Acre yield		Plants erect at harvest	Lodging		Ears Infested earworm	Ear ht.	Ears per plant	Husk		Shelling	Moist. in grain	Stand
	1953	3-year average 1951-53		Root	Stalk				Length	Tightness			
	bu.	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Dixie 17	50.6	45.0	78	5	17	87	3.0	1.2	1.4	1.4	86.6	11.9	97
Dixie 82	45.8	39.4	93	1	6	82	3.2	1.1	2.4	2.0	82.4	11.8	98
Miss. 2004	44.8		98	0	2	78	3.4	1.0	2.8	2.6	83.4	11.9	94
Miss. 3204	44.4		96	0	4	82	3.2	1.0	2.6	2.6	81.3	12.1	98
Coker's 911	44.2		98	1	1	82	3.0	1.0	1.8	1.6	86.1	12.3	95
Miss. 3208	42.7		98	0	2	83	3.2	1.0	2.0	2.0	83.5	12.6	97
Miss. 3226	42.2		90	2	8	82	3.0	1.1	2.6	2.4	81.7	12.4	98
Miss. 1123	41.8		96	1	3	71	3.4	1.0	2.4	2.2	83.3	11.9	95
Dixie 22	40.7	37.6	91	3	6	86	3.0	1.0	2.0	1.2	83.1	12.1	92
Miss. 1216	39.3		93	2	5	89	3.0	1.0	2.6	2.6	84.6	12.7	93
McCurdy 1005W1	37.4		72	7	21	88	3.0	1.0	1.2	1.2	85.3	11.6	89
Coker's 811	37.3	36.5	95	1	4	80	3.0	1.0	2.0	2.0	83.3	12.7	96
Miss. 2020	37.2		97	1	2	88	3.0	1.0	3.0	3.0	79.9	11.6	86
McCurdy 1003	36.3		92	5	3	82	3.0	1.0	2.4	2.0	85.1	11.8	84
Miss. 2006	36.3		99	0	1	86	3.2	1.0	2.4	2.0	82.2	12.4	91
Funk G721	35.9		74	4	22	81	3.0	1.0	2.2	2.2	85.0	11.9	88
Dixie 11	35.7	35.6	90	4	6	85	3.2	1.0	2.2	2.0	87.2	12.1	95
Dixie 18	35.6	31.9	93	4	3	75	4.0	1.0	3.0	3.0	84.2	12.4	88
Miss 2018	35.5		97	1	2	84	3.2	1.0	3.0	2.8	78.9	12.3	97
Miss. 3222	35.1		92	3	5	84	3.0	1.0	3.0	2.2	80.8	11.9	96
Funk G714A	34.8	33.1	85	6	9	84	3.0	1.0	2.4	2.2	83.3	11.9	97
Funk G785W	32.5	33.0	89	7	4	91	3.0	1.0	1.6	1.6	84.4	12.1	95
McCurdy 1002A	29.8		91	4	5	89	3.0	1.0	1.8	1.4	81.5	11.9	84
*Station Mosby	29.4	29.1	77	10	13	92	4.0	1.0	1.4	1.2	82.5	12.3	92
Funk Exp. 24007	26.7		91	2	7	90	3.4	1.0	2.0	1.8	80.0	12.6	96
Miss. 2113	**26.4**		**99**	**0**	**1**	91	3.8	1.0	3.0	2.8	77.1	13.0	86
Miss. 1125	24.5		97	1	2	96	4.2	**1.0**	3.0	2.4	77.8	13.7	96
Miss. 2117	23.4		99	0	1	95	4.0	1.0	2.6	2.2	75.9	11.9	88

A difference in yield of at least 5.7 bushels per acre is required to be considered significant

*Open pollinated varieties.

Table 10. Main hybrid corn test, Raymond, Mississippi, 1953.

Entry	Acre yield		Plants erect at harvest	Lodging		Ears Infested earworm	Ear ht.	Ears per plant	Husk		Shell-ing	Moist. in grain	Stand
	1953	3-year average 1951-53		Root	Stalk				Length	Tight-ness			
	bu.	bu.	%	%	%	%	ft.	no.	in.	grade	%	%	%
Miss. 3208	47.4		98	2	0	74	3.0	1.0	2.6	2.2	80.7	13.9	98
Dixie 17	47.2	46.1	94	2	4	82	2.6	1.2	1.8	1.8	85.8	11.2	98
Miss. 3204	44.1		98	0	2	79	3.4	1.0	2.8	2.2	78.9	12.9	98
Miss. 3222	43.9		98	2	0	74	3.4	1.1	3.2	3.0	82.0	12.5	97
Miss. 2004	42.5		100	0	0	79	3.4	0.9	3.2	1.8	80.8	14.2	100
Miss. 1123	42.3		98	2	0	62	3.4	1.0	3.0	1.8	80.8	12.2	98
Funk G721	42.0		88	8	4	73	2.8	0.9	2.0	2.2	84.1	12.2	92
Miss. 3226	42.0		98	2	0	73	3.2	1.1	3.0	2.2	80.8	13.4	98
Pfister (PAG) 486	40.7		93	2	5	72	3.0	1.0	2.2	1.8	86.6	12.5	96
Miss. 2018	40.0		100	0	0	80	3.2	1.0	3.2	3.0	77.6	12.8	99
Coker's 911	39.9		98	2	0	75	2.4	1.0	1.8	2.6	83.9	13.6	95
Dixie 18	38.9	39.3	97	1	2	63	3.4	1.0	3.2	2.8	83.4	14.8	95
Dixie 11	38.6	40.5	88	12	0	61	3.0	1.1	2.2	2.2	85.7	13.1	96
Dixie 82	38.1		97	3	0	72	3.0	1.0	2.8	2.6	80.1	12.7	98
Miss. 1216	37.1		98	0	2	69	2.8	1.0	3.2	1.2	92.5	14.3	96
Funk G785W	36.2	37.5	96	2	2	76	3.2	1.0	1.8	2.0	83.3	12.5	98
Dixie 22	35.7	37.3	96	3	1	85	3.4	0.9	2.0	2.2	81.1	12.4	96
Miss. 2020	35.7		100	0	0	77	3.2	1.0	3.2	3.0	78.5	12.5	97
Coker's 811	35.5	33.8	98	2	0	75	2.6	1.0	1.8	1.6	80.0	15.0	99
Funk Exp. 24007	34.8		93	7	0	81	3.0	0.9	2.2	1.4	80.1	13.9	95
Miss. 2006	34.8		100	0	0	79	3.2	1.0	2.6	3.0	78.9	12.8	99
McCurdy 1005W1	34.5		89	8	3	89	2.4	1.0	2.0	1.8	86.0	10.6	90
Funk G714A	29.9	31.5	90	5	5	75	2.6	1.0	2.6	1.8	81.7	11.2	95
*Station Mosby	28.6	32.4	86	12	2	84	3.4	0.8	2.6	2.2	79.9	13.1	96
McCurdy 1002A	26.2		93	6	1	74	3.2	0.8	2.4	2.6	78.2	12.8	92
McCurdy 1003	21.1		98	0	2	73	2.4	0.7	3.0	1.2	81.8	12.4	78
Miss. 2113	18.3		100	0	0	94	3.6	0.8	2.8	2.8	67.0	18.6	96
Miss. 1125	18.2		100	0	0	91	4.0	0.7	3.0	2.6	64.0	20.2	98
Miss. 2117	18.0		100	0	0	97	3.6	0.8	2.4	2.8	69.4	18.3	93

A difference in yield of at least 7.7 bushels per acre is required to be considered significant.

*Open pollinated varieties.

Table 11. Main hybrid corn test, Yazoo City, Mississippi, 1953.

Entry	Acre yield 1953	Acre yield 2-yr. average 1952-53	Plants erect at harvest	Lodging root	Lodging stalk	Ear-worm damage	Ear height	Ears[2] per plant	Un-[2] sound ears	Stand	Ear[3] appearance
	bu.	bu.	%	%	%	score[1]	ft.	No.	%	%	score
Miss. 3226	82.7		96	1	3	.8	3.5	1.2	14	90	2
Miss. 3208	82.7		98	0	2	1.2	3.8	1.1	9	95	2
Miss. 3204	82.0		97	1	2	1.1	3.7	1.2	9	92	2
Miss. 1125	81.1		98	1	1	1.3	4.0	1.1	4	88	2
Miss. 3222	77.6		99	0	1	1.7	3.5	1.2	6	91	3
Funk Exp. 24007	74.9		96	1	3	1.3	3.9	1.0	10	89	3
Dixie 82	74.8	46.4	95	1	4	1.0	3.9	1.3	11	83	3
Dixie 11	73.4	48.2	92	3	5	.6	3.8	1.5	3	75	1
Miss. 2006	72.3		96	2	2	.8	3.8	1.0	4	90	2
Dixie 17	70.0	51.1	91	2	7	2.2	3.6	1.2	4	90	2
Funk G 785W	68.9	42.0	93	1	6	1.3	3.9	1.2	5	97	2
Pfister (PAG) 486	67.1	40.8	93	3	4	1.7	3.3	1.1	12	88	3
Miss. 1123	66.4	39.8	97	1	2	1.0	3.4	1.1	18	88	3
Miss. 2020	66.0		98	1	1	1.0	3.6	1.0	13	87	3
Miss. 2004	65.8		98	0	2	.8	3.7	1.0	11	89	2
Miss. 2018	65.6		97	1	2	.7	3.9	1.0	10	78	3
Miss. 2113	65.4		94	2	4	.6	4.0	.9	3	75	1
McCurdy 1005W1	64.2		85	6	9	2.3	3.8	1.1	6	84	3
Miss. 1216	64.1		92	2	6	.7	3.4	1.3	5	79	1
*Station Mosby	62.5	37.8	95	0	5	1.7	4.5	1.0	8	80	3
Dixie 18	62.4	42.2	96	1	3	.5	3.7	1.1	10	89	1
McCurdy 1003	61.5		99	0	1	1.0	3.5	1.0	15	88	3
Dixie 22	58.4	42.6	97	1	2	1.7	3.4	1.0	4	84	2
Coker 911	57.6	37.6	96	1	3	1.7	3.1	1.0	6	85	4
Funk G721	56.1	38.5	91	3	6	1.5	3.3	1.0	8	73	3
Miss. 2117	53.7		94	2	4	1.0	3.9	.9	5	64	2
Coker 811	52.9	36.4	97	1	2	.8	3.5	1.1	1	83	3
McCurdy 1002A	52.8		95	1	4	1.4	3.6	1.0	10	78	4
Funk G714A	50.0	34.8	93	2	5	1.3	3.7	1.1	5	85	2

A difference in yield of at least 9.4 bushels per acre is required to be considered significant

*Open pollinated varieties

[1] Earworm damage: O = none, 4 = severe damage. Data from 3 replications

[2] Data from 3 replications.

[3] Ear appearance: 1 = good, 4 = poor. Data from 3 replications.

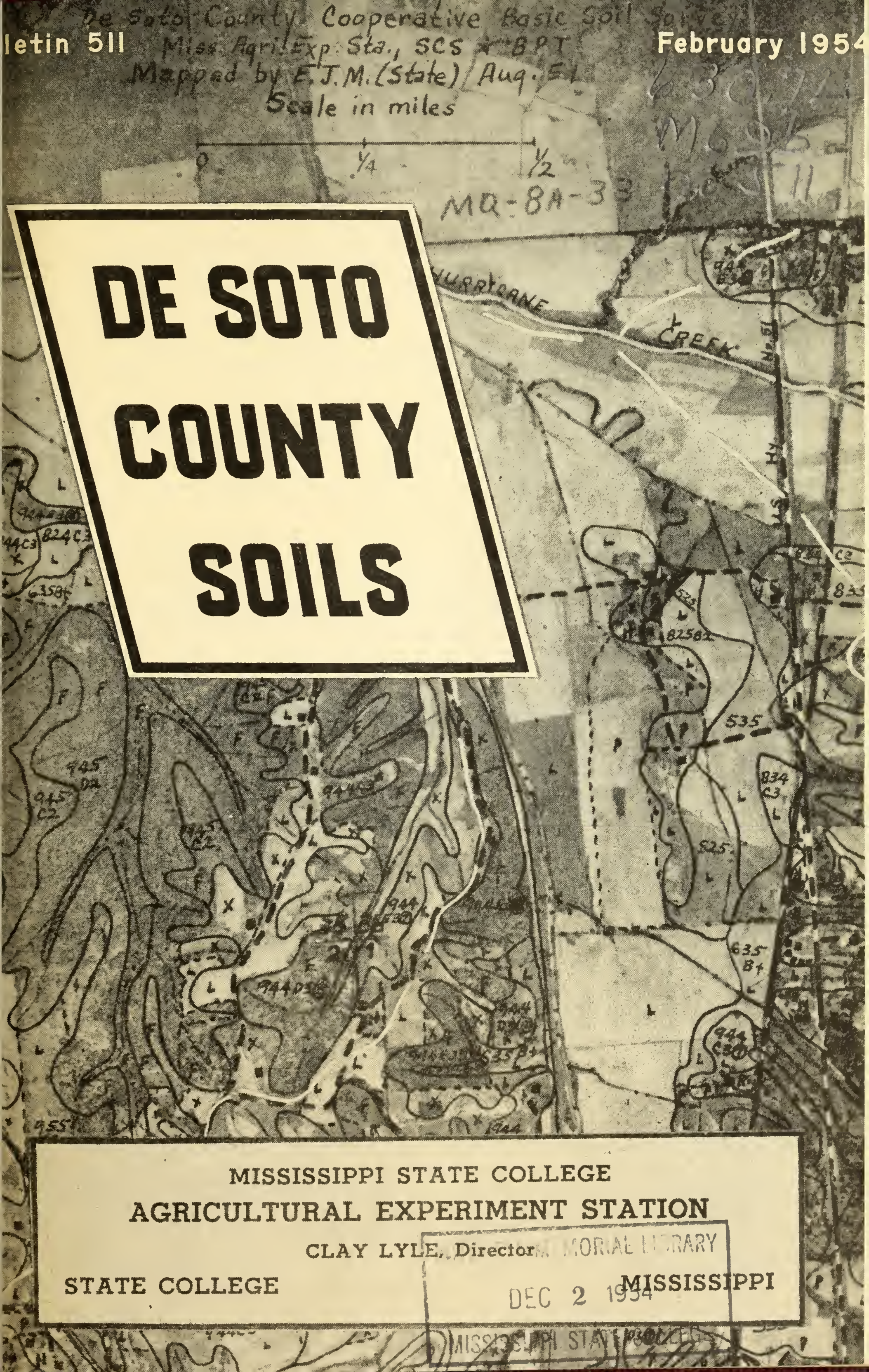
Table 12 Main hybrid test at Poplarville, Mississippi. 1953.

Entry	Acre yield 1953	Acre yield 3-year average 1950-52	Plants erect at harvest	Lodging Root	Lodging Stalk	Ears infested Rice weevil	Ears infested Ear-worm	Ear ht.	Ears per plant	Husk length	Husk tight-ness	Shell-ing	Stand
	bu.	bu	%	%	%	%	%	ft.	No	in.	grade	%	%
Miss. 1125	31.8		98	0	2	45	88	3.5	1.0	3.3	2.5	81.4	97
Miss. 2004	30.7		99	0	1	76	90	3.2	1.0	2.8	2.2	80.6	96
Dixie 82	30.7		91	0	9	81	86	2.8	1.0	2.5	2.0	79.2	97
Dixie 11	28.2	48.5	73	7	20	64	85	3.2	1.0	2.0	2.0	84.9	97
Miss. 2117	27.3		96	0	4	54	91	3.2	0.9	2.7	2.0	78.8	95
Funk Exp. 24004 (w)	27.1		64	10	26	51	85	3.3	0.9	2.2	2.2	81.0	98
Miss. 2113	27.1		97	0	3	36	88	3.3	0.8	3.3	2.7	81.0	96
Miss. 1216	25.2		94	1	5	64	78	2.7	0.9	3.0	2.3	83.3	87
Dixie 18	24.6	50.2	91	1	8	54	80	3.5	1.0	3.3	2.8	82.3	96
Miss. 1123	24.1		97	0	3	67	67	3.0	1.0	2.8	2.3	77.8	97
Coker 911	24.1		92	0	8	35	89	2.3	0.8	2.0	1.5	81.2	98
Funk G737	22.8	36.7	83	3	14	56	87	3.0	1.0	2.2	2.0	80.2	94
Miss. 2018	22.8		94	0	6	66	75	2.8	0.8	3.2	2.3	77.3	99
Coker 811	22.7	49.7	96	2	2	53	81	2.5	1.0	2.3	2.2	79.6	97
Funk G791W	22.6	41.6	76	9	15	66	83	2.5	0.9	2.0	1.8	80.6	95
Miss. 2006	21.6		91	0	9	77	86	2.3	0.8	3.2	2.5	78.2	90
Funk Exp. 24006 (Y)	20.5		91	3	6	68	92	3.5	0.8	1.8	1.7	76.0	98
*Station Mosby	20.5	42.9	77	11	12	71	90	3.3	0.7	2.2	1.8	80.2	97
Miss. 2020	19.5		98	0	2	75	90	2.7	0.9	3.0	2.0	76.0	98

There were no significant differences in yield among varieties in 1953.

*Open pollinated varieties

letin 511 February 1954


De Soto County Cooperative Basic Soil Survey
Miss. Agri. Exp. Sta., SCS & BPI
Mapped by E.J.M. (State) Aug. 51
Scale in miles
0
1/4
1/2
MQ-8A-3
HURRICANE CREEK
535
834 C3
525
635 B+
944 C3
945 D2
945 C2
944 D3
824 C3

630.7 M69 no.511

DE SOTO COUNTY SOILS

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SOIL SURVEY PARTY FOR DE SOTO COUNTY

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M. C. Tyer	Soil Conservation Service

The Soil Conservation Service and the Bureau of Plant Industry, Soils and Agricultural Engineering cooperated with the Mississippi Agricultural Experiment Station in the Soil Survey of De Soto County.

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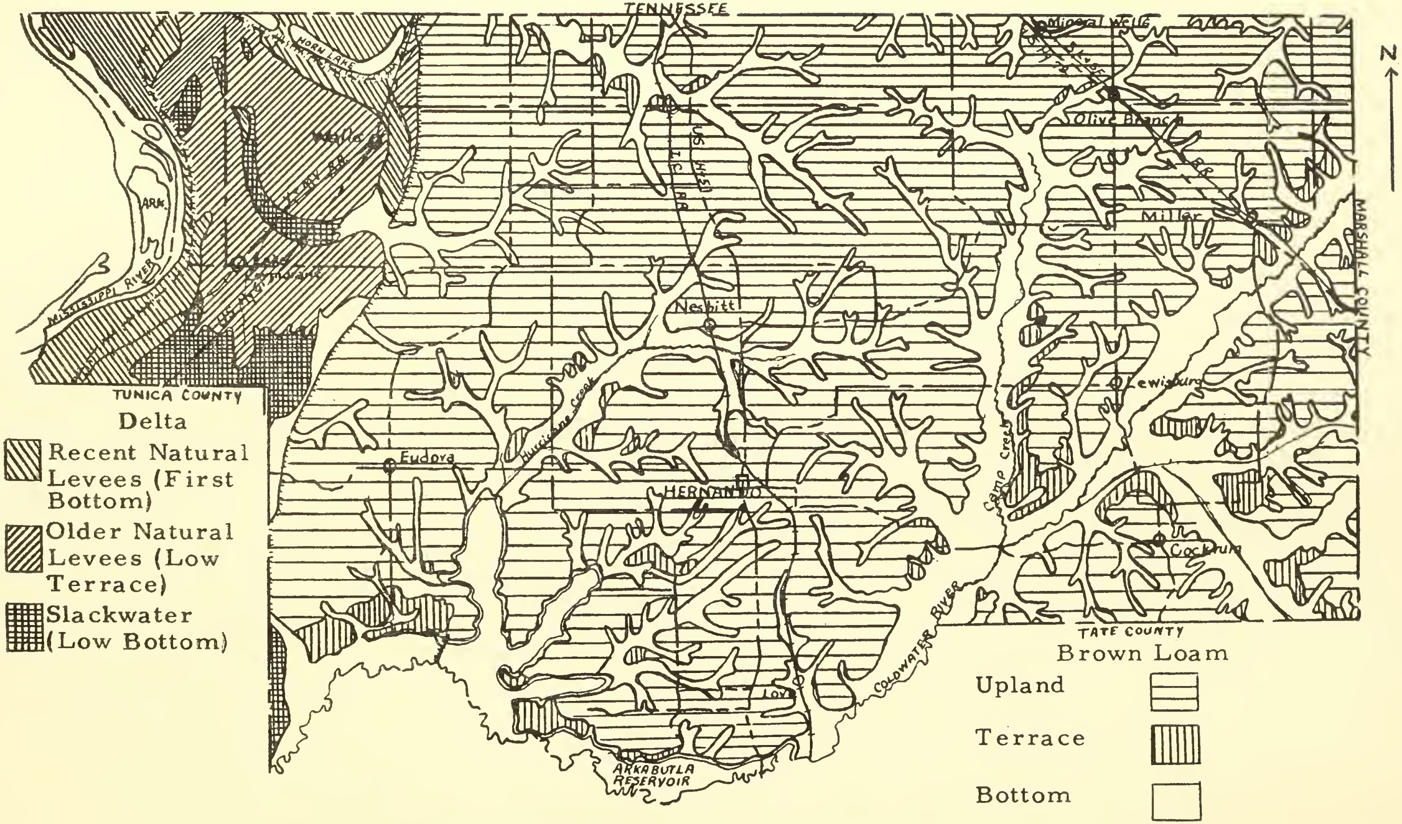
N
TENNESSEE
MARSHALL COUNTY
TUNICA COUNTY
TATE COUNTY
Mineral Wells
Olive Branch
Miller
Lewisburg
Cockrum
Nesbitt
HERNANDO
Eudora
Walls
Lake Cormorant
Love
US HY 51
I C RR
Y & M V RR
US HY 61
HORN LAKE
MISSISSIPPI RIVER
ARK.
Hurricane Creek
Camp Creek
COLDWATER RIVER
ARKABUTLA RESERVOIR
Delta
Recent Natural Levees (First Bottom)
Older Natural Levees (Low Terrace)
Slackwater (Low Bottom)
Brown Loam
Upland
Terrace
Bottom

Figure 1. Major Soil Groups of De Soto County.

DE SOTO COUNTY SOILS

By E. J. McNUTT and H. B. VANDERFORD

This soil report is written primarily for agricultural workers and the farmers of DeSoto County. It has been prepared to aid them in their study and use of the soil maps of this county. The management recommendations are based on field experiments of the Mississippi Agricultural Experiment Station, observation and field studies and the experience of good farmers. Suggestions are included regarding use, conservation and management of the various soils of the county.

In using this bulletin with a soil map of De Soto County, follow the instructions below for easy reference.

1. Locate the boundary of your farm on the soil map.
2. Note soil numbers on your soil map. Determine the soil group of your land by locating these numbers in the index of this bulletin.
3. The index will also give the page numbers where the use and management of the soil group is discussed.
4. For further information, turn to the table of contents.

General Information on De Soto County Soils

De Soto County is divided into two main soil areas — the Loess Hills or "Brown Loam" and the Mississippi River Flood Plain or "Delta". The soils of the Brown Loam were derived from loess which is a silty wind blown deposit. The soils of the Delta were formed from sediments deposited by the overflowing Mississippi River or its tributaries.

Soils of the Loess Hills or Brown Loam

The generally accepted theory of the origin of the loess or silty soil material from which these soils were developed is that during certain stages of the ice age, the melting of the glaciers during the summers caused large volumes of water to flow toward the gulf. This created great floods which carried enormous quantities of "rock flour" or finely ground rock. During the cold winters the flow of the water would be stopped or greatly reduced, and wide broad flats of this silty material was left over the flood plains exposed to the sun and wind. Prevailing winds out of the southwest lifted clouds of the dry silt into the air and it settled on the hills and valleys east of the river flood plain. The theory helps explain the fact that the wind-blown silty deposits are deep on the bluff bordering the Delta and thin out gradually to the east.

The soils of the Brown Loam area are divided into four general groups as follows:

1. **Soils of the uplands.** The uplands portion is dissected with numerous drainageways and streams. As stated before the soils were formed from silty wind-blown materials. Subject to severe erosion, a continuous row-cropping system has caused much of the soil to be washed away and deep gullies have formed. This is especially true on cultivated slopes of five percent or more. Many of the cultivated areas have had the silt loam surface layer removed by erosion, leaving the silty clay loam subsoil exposed on the surface. The soils of the uplands range from the Natchez soils on the bluff beginning at the edge of the Delta and extending eastward through the Loring Deep phase, Loring, Grenada, Calloway, and Henry soils. The topography ranges from level to hilly (slope 0 to over 17 percent). The upland soils cover ap-

proximately 65 percent of the area of the county.

A few small areas of soils formed from coastal plain materials are found in the upland area, usually on the steeper slopes bordering the major stream flood plains. These soil profiles contain much gravel, as in the Guin soils, or sand, as in the Kershaw soils. In addition to these two series, there are two soil complexes composed of intermingled soils of two or more series that cannot be easily separated on the map. These two complexes are Lexington-Loring-Providence and Brandon-Loring. The Lexington, Providence and Brandon soils are composed of a thin mantle of loess (silty wind blown material about two feet thick) over coastal plain sandy or gravelly material. These two complexes and the Guin and Kershaw soils make up about two percent of the total of the upland soils.

2. Soils of the Terraces. These soils are found bordering the major stream flood plains in the Brown Loam area. They were formed from silty material washed from loess-formed soils and deposited by the streams when they flowed at a much higher level. There is little observable differences in the profiles of similar soils of the terraces and uplands. The separations of these two are based primarily on position. In cultural practices and treatment these soils respond similar to the upland soils. The topography of these soils is less rugged than the soils of the upland. Except for some steep escarpments along stream channels or former stream channels, the usual slope is gently undulating to undulating. The soil series of this group, from best to poorest drained, are: Lintonia, Richland, Olivier and Calhoun. These soils comprise about two percent of the total land area of the county.

3. Soils of Local Alluvium. These soils occupy the long narrow upland drainageways, upland depressions and toe slopes bordering the stream flood plains. They consist primarily of silty material washed or sloughed down from local loess-formed soils. They are subject to both deposition and removal of soil material by flood water. These overflows are usually of short duration and ordinarily little damage is done to crops on these soils. The soil series of this group, from best to poorest drained, are: Tigrett, Briensburg and Dyer. In addition to these, there is one other mapping unit called mixed local alluvium composed of a mixture of sand, silt and gravel materials. All the soils of this group cover about five percent of the total land area of the county.

4. Alluvial Soils or Soils of the Bottoms. These soils are composed of silty material washed from soils or loess origin and deposited by the overflowing streams in their flood plains. These soils are similar in many respects to the Local Alluvial, differing primarily in being located in broader more level and uniform areas. This group represents some of the best soils for cultivated crops in the county. They are subject to flooding during prolonged rainy periods and some crop damage may be expected, especially on some of the poorer-drained soils during wet years. This group is composed primarily of the soils of the Vicksburg, Collins, Falaya and Waverly series with a few areas of Hymon and Ina soils and a soil complex called mixed alluvium. The bottoms make up about thirteen percent of the soils of the county.

Soils of the Misssissippi River Floodplain or "Delta"

Approximately 15 percent of the area of De Soto County is in the Delta. Practically all of the Delta soils were developed from sediments deposited by the Mississippi River. On the eastern side of the Delta the Coldwater River and some of the smaller streams such as

Whites Creek, Jackson Creek and Johnson Creek have influenced small areas of Delta soils with silty materials washed from the Brown Loam.

The sediments from which the soils are formed have been deposited recently, in terms of geologic age. The total depth of sediments, however, may be several hundred feet thick. A wide variety of minerals are included in these sediments since the drainage area above De Soto County includes some 20 states. Many of these minerals come from fresh unweathered glacial sources and some from highly weathered sources. This has resulted in a wide range of minerals in the Delta soils of DeSoto County.

The rate of flow of water determines the distribution of sediments of different textures carried by any stream. As a heavily laden stream overflows its banks the rate of flow of water is decreased and the heavier sediments are deposited. This eventually results in a natural levee being formed along the channel of the stream. As the water flows on over the land, its speed is gradually reduced and smaller lighter particles are deposited until it reaches the low slack water areas where the lightest particles or clay sediments are deposited. This natural process of levee building goes on until eventually the levees and the stream bed itself may become higher than the slack water area. During floods the river may leave its channel and flow through the low areas where the process of natural levee formation is repeated. Thus the area will eventually be interlaced with oxbow lakes, bayous and depressions of former stream channels.

In this process of valley filling the natural levees along the present stream channels are still receiving sediments. The older abandoned natural levees are weathering without the addition of fresh materials. The two levee conditions, the slack water area and the depressions form four general soil groups of the Delta as follows:

1. **Soils of the Recent Natural Levees (First Bottom).** These soils are characterized by being neutral to alkaline (sweet) and by having little or no profile development. The sediments deposited by the river are alkaline due to the presence of lime, and since it takes some time for the lime to leach from an alkaline soil to form an acid (sour) soil, the soils of the recent natural levees remain alkaline. Alkaline seep water coming under the artificial levee during periods of high floods helps to keep some of the protected soils near the levee sweet. Most of these soils are light colored due to the fact that organic matter has not built up in them. In the deposition of sediments the heavier sandy materials were first deposited from the overflowing water and the Crevasse soils were formed. Next in order are the Robinsonville, Commerce and Mhoon soils. The First Bottom group of soils comprise about 13 percent of the soils of the Delta region or about two percent of the soils of the county.

2. **Soils of the Older Natural Levees (Low Terrace).** The soils of this group are found bordering former channels and runs of the Mississippi River, usually on the highest elevations in the Delta. They were formed from the heavier sediments deposited from relatively fast moving water. Ordinarily the sandy-textured soils occur on the former stream bank and the texture gradually changes until the clay-textured soils of the slack water areas are reached. These soils have been free from overflowing long enough to have some profile development and have been in place long enough to have become partially leached. These productive soils are usually medium to slightly acid or sour. Locally, they are called sandy or loamy soils. They are the most abundant of any of the four groups of soils in the Delta region of the county, covering approximately 47 percent of that area or

Deep, well drained, bottomland soils (left photograph) are used for row crops. The photograph on the right illustrates the loess (wind-blown material) over coastal plain sand and gravel.

about seven percent of the total area of the county (see figure 1). The soils of this group are composed primarily of the Bosket, Dubbs, and Dundee series with a few small areas of the Clack, Beulah and Forestdale series.

3. Soils of the Slackwater Group (Low Bottom). The soils of this group were formed from Mississippi River sediments high in clay content deposited by slow moving or still water. They are usually found on some of the lower elevations in relatively broad, level to nearly level areas. These soils are high in natural fertility but poor physical characteristics (such as high clay content, poor internal drainage, cracking when dry, sticky or gummy when wet) limit the production of some crops. These soils comprise approximately 20 percent of the Delta area or about three percent of the total area of the county (see figure 1).

4. Soils of the Depressions. These soils, not shown in figure 1, occur in each of the three previously mentioned groups. These are low usually long and narrow areas where excess water accumulates from the surrounding higher land. Their poor internal drainage, slow runoff, and low position limit the production of some crops. They cover approximately seven percent of the Delta area or about one percent of the total area of the county.

Physiography, Relief And Drainage

The Delta slopes gradually to the south, its elevation ranges from 200 to 210 feet above mean sea level. The elevation of Walls, in the north part of the Delta region, is 210 feet and Lake Cormorant, in the south part of the Delta region, is 205 feet above mean seal level. The relief is level to undulating with a few steeper narrow escarpments along some of the streams and bayous or their former banks. It is drained by the Mississippi River (the portion unprotected by the levee), and Lake Cormorant Bayou and its small tributaries. Horn Lake, in this area, was formed by a Mississippi River cut-off which occurred many years ago and covers about 1000 acres.

The Loess Hills or Brown Loam area of the county is subject to severe erosion and gullies are evident throughout most of it, with many areas of rough gullied land in various sections of the county. The erosion hazard has been increased by the cultivation of row crops (principally cotton) on slopes that were too steep for row crops. The most rugged and steep slopes are found along the loess bluffs bordering the eastern side of the Delta. The more nearly level upland is found in the northeast part of the county adjoining the Tennessee State line. The elevation ranges from a low of 190 feet above sea level in the Coldwater River bottom at the Tunica County line to 400 feet at Olive Branch in the northeast corner of the county.

Most of the Brown Loam area is drained by the Coldwater River and its tributaries. Sam Creek, Hurricane Creek (with its tributary Wolf Creek), Muscanna Creek, Cane Creek, Short Fork Creek, Camp Creek (with its tributaries Bean Patch Creek and Nolehoe Creek) all flow generally in a south or southwestern direction and enter the Coldwater River to the south. Caney Creek, Jourdan Creek, and Pigeon Roost Creek (with its tributaries Byhalia Creek and Red Banks Creek) flow generally in a northwestward direction and enter the Coldwater River to the north. Horn Lake Creek in the northwest part of the Brown Loam area flows northwestward into Tennessee and finally into Horn Lake. Along the western edge of the Brown Loam, Johnson Creek, Jackson Creek and Whites Creek flow westward into the Delta and then on into Lake Cormorant Bayou, which eventually flows into the Coldwater River to the south.

There is one large artificial lake, Arkabutla Lake, in the Brown Loam region which has a 5,100 acre conservation pool and a 33,400 acre flood control pool. This lake, formed by an earth fill dam on the Coldwater River, is located a few miles up the river from where it flows into the Delta. Its principal use is flood control. It is also used for such recreation as hunting, fishing, boating, etc.

Vegetation

The native vegetation of the Delta area of De Soto County consisted primarily of hardwoods, chiefly oak, walnut, hackberry, elm, gum, beech, willow, birch, sycamore, hickory, wild pecan, ash and maple with some cypress and a dense undergrowth of vines and canes. In the Brown Loam the above mentioned trees as well as cherry, holly, mulberry, yellow poplar, sasfras, honeylocust, boxelder, and dogwood grow with some cedar.

Only about 15 percent of the land has never been cleared. The woodland is confined chiefly to the stronger slopes of the uplands, the Coldwater River bottom and practically all of the area between the Mississippi River and the protective levee.

Agriculture

Most of the crops of this section of the country are grown to some extent in De Soto County. Since the days of the early settlers, cotton has been the chief source of income for farmers. Cotton is grown to some extent throughout the county and quite extensively in the Delta region. Corn is also grown throughout the county with some rather high yields (100 bushels or more to the acre) being produced the last few years on some of the better soils. The acres devoted to the main crops in 1949 were as follows: cotton 51,810, corn for grain 25,868, soybeans for beans 2,208, soybeans for other purposes 1,571, oats for grain 1,109, sorghum for silage 926, cowpeas for all purposes 1,500, lespedeza for hay, 11,720, vegetables harvested for sale 291, and tree fruits 438.

Dairying and beef cattle production are second only to cotton in source of income. Since 1920 the number of cattle has doubled in De Soto County. With a good market for both dairy products and beef cattle in nearby Memphis, much emphasis is being placed on these enterprises. Much of the soil that erodes too easily to be in cultivated crops may be made to produce good pastures with proper seeding and management .

Soil Survey Methods and Definitions

Soil surveying consists of the examination, classification, and mapping of soils in the field and the recording of their characteristics, both internal and external, with special interest upon the features that influence the adaptation of the land for the growing of crop plants, grasses and trees.

The soils are examined systematically in many locations. Test pits are dug, numerous borings are made; and exposures, such as those in road or railroad cuts, gullies, ditches, pits and other excavations are studied. Each excavation exposes a series of layers or horizons, called collectively the soil profile. Each horizon of the soil, as well as the parent material beneath the soil is studied. The following characteristics are noted:

1. Texture—The percent of sand, silt and clay.

2. Color—An indication of internal drainage and organic matter content.

3. Structure—The arrangement of the individual particles into aggregates.

4. Reaction—The acidity or alkalinity (sourness or sweetness) of the soil.

5. Permeability—The quality of the soil that enables it to transmit water or air.

6. Internal drainage—That quality of the soil that permits the downward flow of water through it.

7. Runoff—The rate of surface water runoff.

Also noted are the arrangement and thickness of the different layers or horizons, the nature of the parent material. the topography or lay of the land, and the degree of both sheet and gully erosion.

Upon the basis of their characteristics, soils are grouped into classification units. The three principal units are: (1) series, (2) type, and (3) phase. In places two or more of these principal units may be in such intimate or mixed patterns that they cannot be clearly shown separately on the map and must be mapped as a complex.

A soil series is a group of soils similar in almost every respect except the texture of surface layers. Therefore, a series is composed of soils with essentially the same color, structure, and other important internal characteristics, the same natural drainage conditions and the same range in relief. The textures of the surface or plow layers may differ within a series. Sharkey, Dowling, Bosket, Commerce, Loring, Richland and Collins are names of important series found in this county.

Within a soil series are one or more soil types, defined according to the texture of the surface layer of the soil. Thus the class names of the soil texture, such as clay, silty clay, silty clay loam, silt loam, very fine sandy loam, and fine sandy loam is added to the series to give the complete name of the soil type. For example Dundee very fine sandy loam and Dundee silt loam are soil types of the Dundee series. Except for the surface textures these two soil types have essentially the same internal characteristics.

One soil type may occur on several different slopes and may have different degrees of erosion. These differences in slope and erosion are shown by the use of soil phases. For example, Loring silt loam, eroded gently undulating phase (slope, 2 to 5 percent) and Loring silt loam, hilly phase (slope 17 percent or more) are two phases of the same soil type. These two phases have different management problems. The gently undulating phase may be cultivated easily, where as the hilly phase is too steep for practical cultivation.

Miscellaneous land types are used in soil classification and mapping for areas of land that have no natural soil, or that are too inaccessible for examination, or where for other reasons it is not feasible to classify and map the area in detail. Alluvial soils (unclassified) is a miscellaneous land type used in De Soto County for areas lying between the Mississippi River and the protective levee. Two other miscellaneous land types found in the Loess Hills region are Rough gullied land, Loring soil materials and Rough gullied land, Grenada soil materials.

The soil surveyors have made a map of this county, showing the location of each of the soil types, phases and complexes in relation to roads, houses, streams, lakes and other local cultural and natural features of the landscape.

Know Your Soils and Plan Their Management

First Examine The Soil Map

1. Note Symbols—In using this bulletin it is necessary to examine your soil map and become familiar with the various symbols used to designate certain features of the land (see page 12).

Each separate area of the soil mapped is indicated on the map with a symbol. The first number of the symbol refers to the position of the soil and the source of the parent material, the second number indicates the degree of internal drainage, and the third number gives the texture of the surface layer. These first three* numbers of the soil symbol indicate the soil type. Following these numbers is a capital letter indicating the percent of slope, another number indicates the degree of sheet erosion, another number indicates deep gullies, if any.

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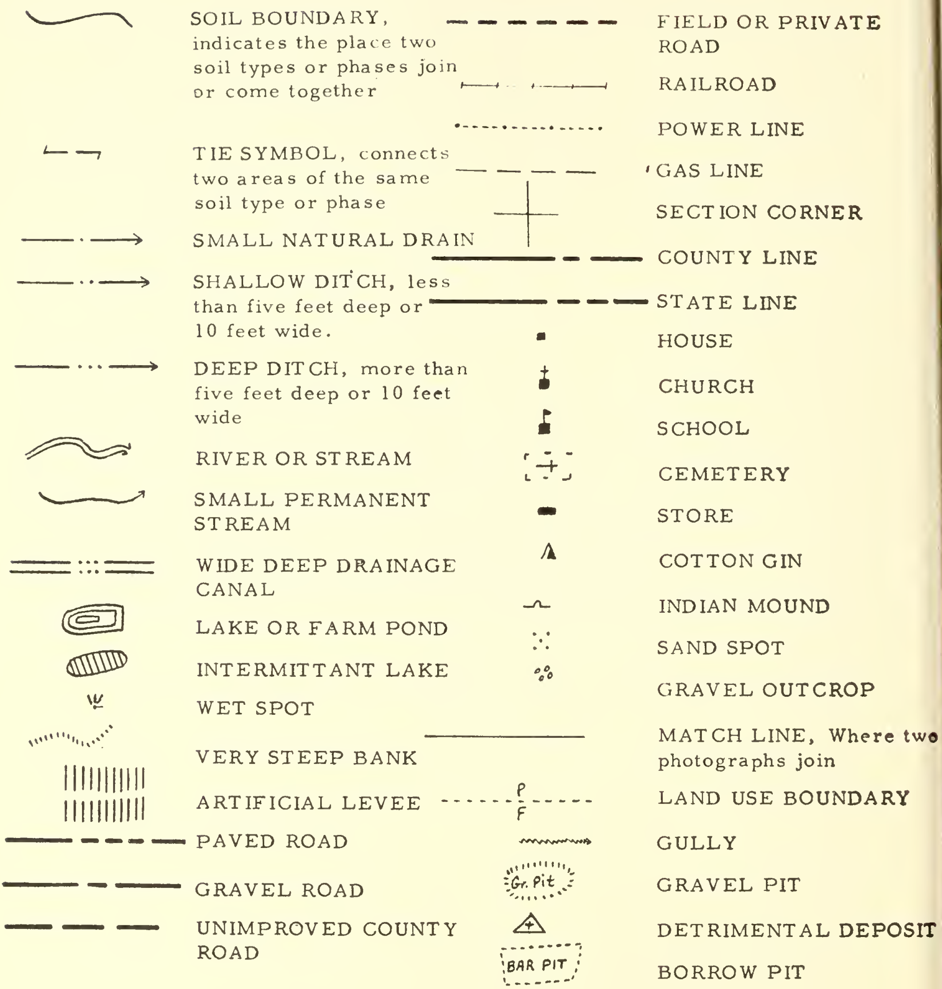
*In the Brown Loam area, the soils formed from coastal plain material or mixed loess and coastal plain material have an additional number in their symbol which indicates that the profile contains some sand, gravel or both.



SOIL BOUNDARY, indicates the place two soil types or phases join or come together

TIE SYMBOL, connects two areas of the same soil type or phase

SMALL NATURAL DRAIN

SHALLOW DITCH, less than five feet deep or 10 feet wide.

DEEP DITCH, more than five feet deep or 10 feet wide

RIVER OR STREAM

SMALL PERMANENT STREAM

WIDE DEEP DRAINAGE CANAL

LAKE OR FARM POND

INTERMITTANT LAKE

WET SPOT

VERY STEEP BANK

ARTIFICIAL LEVEE

PAVED ROAD

GRAVEL ROAD

UNIMPROVED COUNTY ROAD

FIELD OR PRIVATE ROAD

RAILROAD

POWER LINE

GAS LINE

SECTION CORNER

COUNTY LINE

STATE LINE

HOUSE

CHURCH

SCHOOL

CEMETERY

STORE

COTTON GIN

INDIAN MOUND

SAND SPOT

GRAVEL OUTCROP

MATCH LINE, Where two photographs join

LAND USE BOUNDARY

GULLY

GRAVEL PIT

DETRIMENTAL DEPOSIT

BORROW PIT

Learn the above list of symbols so that they may be recognized on the soil map.

BROWN LOAM AREA

Postition

5. Bottoms (alluvial soils)
6. Local Alluvium
8. Terrace
9. Upland

Internal Drainage

1. Poor
2. Poor to somewhat poor
3. Somewhat poor to moderately well
4. Moderately well to well
5. Well
6. Somewhat excessive
7. Excessive

Surface Texture

1. Heavy clay (not used)
2. Clay
3. Silty clay
4. Silty clay loam
5. Silt loam
6. Very fine sandy loam
7. Fine sandy loam
8. Loamy sand
9. Sand

Slope

A. 0 to 2 percent (level)
B. 2 to 5 percent (gently undulating)
C. 5 to 8 percent (undulating)
D. 8 to 12 percent (gently rolling)
E. 12 to 17 percent (rolling)
F. 17 percent or over (hilly)

Erosion

+. Accumulates
1. None to slight
2. Eroded (25 to 75 percent of original surface lost)
3. Severely eroded (more than 75 percent of original surface and up to 25 percent of subsoil lost)
4. Very severely eroded (more than 25 percent of subsoil lost)
8. Frequent shallow gullies
(7). Occasional deep gullies
(8). Frequent deep gullies
9. 75 percent or more of land area destroyed by gullies

Present Land Use

F. Forest
H. Home site
L. Cultivated land
P. Pasture
X. Idle land

DELTA AREA

Position

1. First Bottom
1. First Bottom (recent natural levees)
2. Depression
3. Low Bottom (slackwater deposits)
4. Low Terrace (old natural levees)

Internal Drainage

1. Poor
2. Poor to somewhat poor
3. Somewhat poor to moderately well
4. Moderately well to well
5. Well
6. Somewhat excessive
7. Excessive

Surface Texture

1. Heavy clay (not used)
2. Clay
3. Silty clay
4. Silty clay loam
5. Silt loam
6. Very fine sandy loam
7. Fine sandy loam
8. Loamy sand
9. Sand

Slope

A°. 0 to ¼ percent (level)
A. ¼ to 2 percent (nearly level)
B. 3 to 5 percent (gently undulating)
C. 6 to 10 percent (undulating)
D. Over 10 percent (sloping)

Erosion

+. Accumulates
1. None to slight
2. Eroded (25 to 75 percent of original surface lost)
3. Severely eroded (more than 75 percent of original surface and up to 25 percent of subsoil lost)

Present Land Use

F. Forest
H. Home site
L. Cultivated land
P. Pasture
X. Idle land

Another capital letter found in each area, but not joined to the other symbol, indicates the land use when the area was mapped. For example, the symbol 944C3(7) indicates the following:

9—An upland soil in the Brown Loam region of the county.

4—The soil is moderately well to well drained .

4—The surface layer is a silty clay loam.

C—The slope ranges from 5 to 8 percent .

3—Sheet erosion has removed at least 75 percent of the surface layer and usually part of the subsoil in places.

(7)—There is an occasional (more than 100 feet part) deep gully not easily crossed with farm machinery.

The diagram on page 13 explains the numbers and letters found on the soil map, other symbols may be found on page 12.

2. Entire Soil Profile Important—A soil profile is a vertical section of the soil down through its various layers from the surface through the subsoil and on into the parent material. In studying and classifying soils, the profile must be examined to a depth of 40 inches or more. Often two soils have identical surface layers but may differ widely in the subsoil and hence have different land uses and agricultural values. The subsoil characteristics are important and should be understood.

3. Soil Types Vary—Various soil types or mapping units have a range in properties. The same mapping unit examined in many places may have similar but not necessarily identical characteristics. On one side of the range it may resemble a better soil and on the other a poorer soil. Boundaries between mapping units vary in sharpness. Some may change in a matter of a few feet others may change over a space of 100 feet or more. Between most soil types there is a transitional zone in which the soil has properties common to both.

In some areas the soil types are so intermixed that separation is not practical. These areas are called complexes.

Compare Your Yields With Test Yields

High crop yields year after year are the results of good management. Continued low yields may be caused by poor soil, poor management, or by growing unadapted crops. Tables 1 and 3 show average yields that can reasonably be expected for cotton, corn, or soybeans, and acres of permanent pasture required per animal unit on these soils over a five-year period under good management.

Actual production records must be kept to make yield comparisons. Five-year records are necessary for good averages because of wide seasonal variations in rainfall, temperature, and insect or disease injury Unless yearly records are maintained, the high yields are likely to be remembered and the low yields forgotten.

Practices resulting in high yields of one crop, such as cotton, will not necessarily produce high yields of other crops. Some soils will produce higher yields of a specific crop than other soils. Therefore, the first step in producing high yields of any crop is to select land to which this particular crop is adapted. Since cotton is still the chief cash crop on most farms, the best-all-round land on the farm is usually planted to this crop. However, it is important that the remaining soils on the farm be planted to some adapted crop to which the soils' poor physical characteristics are not a limiting factor to good yields.

Since new crop varieties, new cultural practices, new plant disease, and new insect pests may greatly affect yield levels in the future, the figures in tables 1 and 3 must be regarded as current.

Soil Management

The purpose of this section is to explain briefly some of the principles of good soil management. For recommendations for specific soils, see "Soil Groups of DeSoto County Their Use and Management," page 33. Soil management includes such practices as (1) choice and rotations of crops, (2) fertilization, (3) tillage operations and (4) water control on the land. Since De Soto County has two different soil areas, each with different management problems, they will be discussed separately.

Brown Loam Area
General Recommendations

1. Choice and Rotation of Crops — This is a general discussion of crops and rotations; for recommendations on specific soils see "Soil Groups of De Soto County Their Use and Management" page 33. The better drained bottom and local alluvial soils (those with the second number 3 or 5) are well adapted to the production of both cotton and corn and may be planted to row crops frequently, provided sufficient organic matter is returned to the soil in the form of crop residues, manure, and winter or summer legumes where practical The poorest drained of these soils (those with second numbers of symbol 1) are best adapted to trees, while the other poor to somewhat poorly drained soils (those with second number of symbol 2) are best adapted to pasture and hay production.

In general, crops that effectively retard runoff should be grown more of the time on the steeper than on the less steep slopes of the soils of the uplands or terraces that are similar in every respect except slope. Most of the time for example, the hilly phase should be in forest, sloping phase in forest or pasture, gently sloping phase in pasture, undulating phase in close growing crops and the gently undulating and level phases in row crops.

2. Fertilization—The soils of the Brown Loam area require the addition of commercial fertilizer for the profitable production of crops. Non-legumes require all three major plant food elements, nitrogen, phosphorus (phosphate) and potassium (potash). In general, less nitrogen and more potash is needed in the bottoms and local alluvial areas than on the upland or terraces. Legume crops need phosphorus and potassium and usually lime for best growth. The incorporation of organic matter in the soils in the form of legumes, manure or crop residues is helpful in keeping the soil in a good mellow condition and in increasing the rate at which it will absorb water. Most of these soils are well adapted to the growth of vetch and wild winter peas.

The addition of lime is helpful on the more acid soils for crop production, especially legumes. The need for lime should be established before it is applied. The acidity of the topsoil and the texture are the two factors that govern the amount of lime necessary to adjust the reaction.

Proper soil analysis can serve as a good indicator of soil fertility and the need for lime. Therefore, the farmer should have his soil tested in the laboratory and use this information in developing specific fertilizer practices in his fields. Current fertilizer recommendations of the Mississippi Agricultural Experiment Station should be consulted each year for up to date fertilization information.

To obtain the full value of fertilizer used, it is necessary to control both insects and weeds as well as follow other good farming methods.

3. Tillage Operations — On the soils of the uplands and terraces the soils should be tilled in such a manner that they will be in condition to retard runoff and absorb water. Tillage should be at such times and in such manner that the

Table 1. Estimated average yields of principal crops under good management and proposed general land use recommendations for the Brown Loam soils of De Soto County.

Soil symbol	Soil group	Soil name	Cotton lint (lbs. per acre)	Corn (hybrid) (bu. per acre)	Soybeans (bu. per acre)	Pasture (ac. per animal unit)[1]	Proposed land use[2]	Workability[3]	Conservability[4]
514	5b	Waverly silty clay loam	------[5]	----	----	----	3	Poor	Very good
515	5b	Waverly silt loam	------	----	----	----	3	Poor	Very good
524	5b	Falaya silty clay loam	300	40	18	3.2	2-3	Fair	Very good
525	5b	Falaya silt loam	300	45	18	3.2	2-3	Good	Very good
5256	5b	Ina silt loam	300	45	18	3.2	2-3	Good	Very good
530	1c	Mixed alluvium	425	55	20	2.5	1-2-3	Good	Very good
534*	1b	Collins silty clay loam	600	60	22	2.2	1-2-3	Fair	Very good
535*	1a	Collins silt loam	625	85	22	2.0	1-2-3	Very good	Very good
535B+	1a	Collins silt loam, gently undulating phase	625	85	22	2.0	1-2-3	Very good	Good
5356	1a	Hymon silt loam	600	80	20	2.2	1-2-3	Very good	Very good
555	1a	Vicksburg silt loam	750	90	28	1.6	1-2-3	Very good	Very good
615	5b	Dyer silt loam, level phase	----	----	14	3.6	2-3	Good	Good
615B+	5b	Dyer silt loam, gently undulating phase		----	14	3.6	2-3	Good	Good
630	1c	Mixed local alluvium, level phase	425	60	25	2.0	1-2-3	Very good	Good
630B+	1c	Mixed local alluvium, gently undulating phase	450	65	25	2.0	1-2-3	Very good	Good
630C+	1c	Mixed local alluvium, undulating phase	400	55	22	2.5	2-1-3	Very good	Good
630D+	1c	Mixed local alluvium, gently rolling phase	350	40	18	2.8	2-1-3	Good	Fair
635	1a	Briensburg silt loam, level phase	500	60	25	2.0	1-2-3	Very good	Very good
635B+	1a	Briensburg silt loam, gently undulating phase	550	65	25	2.0	1-2-3	Very good	Very good
635C+	1a	Briensburg silt loam, undulating phase	450	55	22	2.5	2-1-3	Very good	Good
655	1a	Tigrett silt loam, level phase	700	90	30	1.5	1-2-3	Very good	Very good
655B+	1a	Tigrett silt loam, gently undulating phase	700	85	28	1.6	1-2-3	Very good	Very good
655C+	1a	Tigrett silt loam, undulating phase	500	65	25	1.9	2-1-3	Very good	Good
815A1	5a	Calhoun silt loam, level phase	------	----	12	3.5	2-3	Fair	Good
815B1	5a	Calhoun silt loam, gently undulating phase	------	----	12	3.5	2-3	Fair	Good
815B2	5a	Calhoun silt loam, eroded gently undulating phase	------	----	10	3.8	2-3	Fair	Good
825A1	5a	Olivier silt loam, level phase	375	35	22	3.0	2-3	Good	Good
825B1	4	Olivier silt loam, gently undulating phase	425	45	25	2.8	2-1-3	Good	Good

825B2	4	Olivier silt loam, eroded gently undulating phase	375	35	22	3.0	2-1-3	Good	Fair
824B3	4	Olivier silty clay loam, severely eroded gently undulating phase	300	25	15	3.4	2-1-3	Fair	Poor
824C3	6	Olivier silty clay loam, severely eroded undulating phase	250	20	12	3.6	2-3	Fair	Poor
835A1	2b	Richland silt loam, level phase	450	45	20	2.4	1-2-3	Good	Very good
835B1	2b	Richland silt loam, gently undulating phase	500	50	25	2.2	1-2-3	Very good	Good
835B2	2b	Richland silt loam, eroded gently undulating phase	475	45	22	2.4	1-2-3	Good	Good
834B3	3b	Richland silty clay loam, severely eroded gently undulating phase	300	30	15	3.0	2-1-3	Fair	Poor
835C1	3b	Richland silt loam, undulating phase	450	45	22	2.3	2-1-3	Good	Poor
835C2	3b	Richland silt loam, eroded undulating phase	325	35	18	3.0	2-1-3	Good	Poor
834C3	3b	Richland silty clay loam, severely eroded undulating phase	250	25	12	3.4	2-1-3	Fair	Very poor
835D2	3b	Richland silt loam, eroded gently rolling phase	300	30	15	3.2	2-1-3	Fair	Very poor
834D3	4b	Richland silty clay loam, severely eroded gently rolling phase	225	22	10	4.0	2-3	Fair	Very poor
845B1	2a	Lintonia silt loam, gently undulating phase	550	65	28	2.0	1-2-3	Very good	Good
845B2	2a	Lintonia silt loam, eroded gently undulating phase	500	60	25	2.0	1-2-3	Very good	Fair
844B3	3a	Lintonia silty clay loam, severely eroded gently undulating phase	300	35	15	3.2	2-1-3	Fair	Poor
844C3	3a	Lintonia silty clay loam, severely eroded undulating phase	250	20	12	3.4	2-1-3	Fair	Very poor
844D3	6a	Lintonia silty clay loam, severely eroded gently rolling phase	200	15	10	3.6	2-3-1	Fair	Very poor
844E3	6a	Lintonia silty clay loam, severely eroded rolling phase	------	----	----	3.8	2-3	Poor	Very poor
844F3	7b	Lintonia silty clay loam, severely eroded hilly phase	------	----	----	----	3	Poor	Very poor
915A1	5a	Henry silt loam, level phase	------	----	10	3.8	2-3	Fair	Very good

Table 1. Estimated average yields of principal crops under good mangem ent and proposed general land use recommendations for the Brown Loam soils of De Soto County. —(Cont.)

Soil symbol	Soil group	Soil name	Cotton lint (lbs. per acre)	Corn (hybrid) (bu. per acre)	Soybeans (bu. per acre)	Pasture (ac. per animal unit) 1	Proposed land use 2	Workability 3	Conservability 4
925A1	5a	Calloway silt loam, level phase	250	20	15	3.0	2-3	Fair	Very good
925B1	4	Calloway silt loam, gently undulating phase	325	35	20	3.8	2-1-3	Good	Good
925B2	4	Calloway silt loam, eroded gently undulating phase	300	30	18	3.5	2-1-3	Good	Fair
924B3	4	Calloway silt loam, severely eroded gently undulating phase	225	25	12	4.5	2-1-3	Fair	Poor
924C3	6c	Calloway silt loam, severely eroded undulating phase	200	20	10	4.6	2-3	Fair	Poor
930	7c	Rough Gullied Land, Grenada soil materials (all slopes)	------	----	----	----	3	Very poor	Very poor
935B1	2b	Grenada silt loam, gently undulating phase	435	45	25	2.3	1-2-3	Very good	Good
935B2	2b	Grenada silt loam, eroded gently undulating phase	400	40	20	2.8	1-2-3	Good	Fair
934B3	3b	Grenada silty clay loam, severely eroded gently undulating phase	275	25	----	2.7	2-1-3	Fair	Fair
93531	3b	Grenada silt loam, undulating phase	375	35	18	3.0	2-1-3	Good	Fair
935C2	3b	Grenada silt loam, eroded undulating phase	300	30	22	2.6	2-1-3	Good	Poor
934C3	3b	Grenada silty clay loam, severely eroded undulating phase	250	20	16	3.2	2-3-1	Fair	Poor
935D1	3b	Grenada silt loam, gently rolling phase	325	35	20	3.0	2-3-1	Good	Poor
935D2	3b	Grenada silt loam, eroded gently rolling phase	275	30	18	3.5	2-3-1	Fair	Poor
934D3	6b	Grenada silty clay loam, severely eroded gently rolling phase	200	15	10	3.8	2-3	Fair	Very poor
935E1	6b	Grenada silt loam, rolling phase	------	----	12	3.6	2-3	Fair	Poor
935E2	6b	Grenada silt loam, eroded rolling phase	------	----	10	3.8	2-3	Fair	Poor
934E3	7c	Grenada silty clay loam, severely eroded rolling phase	------	----	----	4.0	3	Fair	Very poor
935F1	7c	Grenada silt loam, hilly phase	------	----	----	----	3	----------	------------
934F3	7c	Grenada silty clay loam, severely eroded hilly phase	------	----	----	----	3	------------	-----------
940	7b	Rough Gullied Land, Loring soil							

945B1	2a	Loring silt loam, gently undulating phase	625	60	25	2.2	1-2-3	Very good	Good
945B2	2a	Loring silt loam, eroded gently undulating phase	550	50	22	2.4	1-2-3	Very good	Fair
944B3	3a	Loring silty clay loam, severely eroded gently undulating phase	400	35	18	3.0	2-1-3	Good	Poor
945C1	3a	Loring silt loam, undulating phase	400	45	20	2.4	2-1-3	Good	Poor
945C2	3a	Loring silt loam, eroded undulating phase	375	35	18	2.6	2-1-3	Good	Poor
944C3	3a	Loring silty clay loam, severely eroded undulating phase	300	25	15	2.8	2-1-3	Fair	Very poor
945D1	3a	Loring silt loam, gently rolling phase	350	35	18	3.0	2-1-3	Good	Very poor
945D2	3a	Loring silt loam, eroded gently rolling phase	300	30	15	3.2	2-1-3	Good	Very poor
944D3	6a	Loring silty clay loam, severely eroded gently rolling phase	225	18	12	3.8	2-3-1	Poor	Very poor
945E1	6a	Loring silt loam, rolling phase	----	----	10	3.5	2-3	Poor	Very poor
945E2	6a	Loring silt loam, eorded rolling phase	----	----	10	3.8	2-3	Poor	Very poor
944E3	6a	Loring silty clay loam, severely eroded rolling phase	----	----	8	5.0	2-3	Poor	Very poor
945F1	7a	Loring silt loam, hilly phase	----	----	----	----	3	----	----
945F2	7a	Loring silt loam, eroded hilly phase	----	----	----	----	3	----	----
944F3	7b	Loring silty clay loam, severely eroded hilly phase	----	----	----	----	3	----	----
9448C3	3a	Brandon-Loring silty clay loams, severely eroded undulating phase	300	25	15	3.8	2-1-3	Fair	Very poor
9458E1	6a	Brandon-Loring silt loams, rolling phases	----	----	15	----	2-3	----	----
9448E3	6a	Brandon-Loring silty clay loams, severely eroded rolling phases		----	8	----	2-3	----	----
9458F2	7a	Brandon-Loring silt loams, eroded hilly phase	----	----	----	----	3	----	----
955B2	2a	Loring silt loam, eroded gently undulat-deep phase	650	65	25	1.8	1-2-3	Very good	Fair
954B3	3a	Loring silty clay loam severely eroded gently undulating deep phase	400	40	20	2.3	2-1-3	Good	Poor
955C1	3a	Loring silt loam, undulating deep phase	450	45	22	2.2	2-1-3	Good	Poor
955C2	3a	Loring silt loam, eroded undulating deep phase	400	40	20	2.4	2-1-3	Good	Poor
954C3	3a	Loring silty clay loam, severely eroded undulating deep phase	300	25	15	2.7	2-1-3	Good	Very poor
955D2	3a	Loring silt loam, eroded gently rolling deep phase	375	30	20	2.5	2-1-3	Good	Very poor

Table 1. Estimated average yields of principal crops under good mangement and proposed general land use recommendations for the Brown Loam soils of De Soto County. —(Cont.)

Soil symbol	Soil group	Soil name	Cotton lint (lbs. per acre)	Corn (hybrid) (bu. per acre)	Soybeans (bu. per acre)	Pasture (ac. per animal unit) 1	Proposed land use 2	Workability 3	Conservability 4
954D3	6a	Loring silty clay loam, severely eroded gently rolling deep phase	200	15	12	3.2	2-3-1	Fair	Very poor
955E1	6a	Loring silt loam, rolling deep phase	----	----	15	3.0	2-3	Fair	Very poor
955E2	6a	Loring silt loam, eroded rolling deep phase	----	----	15	3.2	2-3	Fair	Very poor
945E3	6a	Loring silty clay loam, severely eroded rolling deep phase	----	----	10	3.8	2-3	Poor	----
955F1	7a	Loring silt loam, hilly deep phase	----	----	----	----	3	----	----
955F2	7a	Loring silt loam, eroded hilly deep phase	----	----	----	----	3	----	----
954F3	7b	Loring silty clay loam, severely eroded hilly deep phase	----	----	----	----	3	----	Very poor
9546C3	3a	Lexington-Loring-Providence silty clay loams, severely eroded undulating phases	300	25	15	3.7	2-1-3	Fair	Very poor
9546D3	6a	Lexington-Loring-Providence silty clay loams, severely eroded gently rolling phases	----	----	----	3.2	2-3-1	Fair	Very poor
9556E1	6a	Lexington-Loring-Providence silt loams, rolling phases	----	----	----	3.0	2-3	Fair	Very poor
9556E2	6a	Lexington-Loring-Providence silt loams, eroded rolling phases	----	----	----	3.2	2-3	Fair	Very poor
9546E3	6a	Lexington-Loring-Providence silty clay loam, severely eroded rolling phases	----	----	----	4.5	2-3	Poor	----
9556F1	7a	Lexington-Loring-Providence silt loams, hilly phase	----	----	----	----	3	----	----
9556F2	7a	Lexington-Loring-Providence silt loams, eroded hilly phase	----	----	----	----	3	----	----
9546F3	7b	Lexington-Loring-Providence silty clay loam, severely eroded hilly phases	----	----	----	----	3	----	----
965F1	7a	Natchez silt loam, hilly phase	----	----	----	----	3	----	----
9779F1	7a	Guin gravelly sandy loam, hilly phase	----	----	----	----	3	----	----
9779F2	7a	Guin gravelly sandy loam, eroded hilly phase	----	----	----	----	3	----	----
9788E2	7b	Kershaw loamy sand, eroded rolling phase	----	----	----	----	3	----	----
9788E1	7a	Kershaw loamy sand hilly phase	----	----	----	----	3	----	----
9788F2	7a	[illegible]							

soil will be bare of vegetation for as short a period as possible. Rows on these soils should be on the contour. On the more level bottoms and drainageways the rows should ordinarily be run so as to carry the water that falls on it to a ditch or waterway outlet.

All the soils of the Brown Loam area have a relatively wide range of moisture condition at which tillage operations may be carried on successfully. The heavier textured soils (those with the third number in the symbol being 4) have a somewhat narrower range of moisture condition for good tillage operation. Plowing too wet tends to leave the soil in a cloddy condition and makes it more difficult to cultivate. It also tends to break down the good physical structure of the soil making it more difficult for roots and air to penetrate.

4. Water Control on the Land—Water control on the land includes (1) control of too rapid runoff, (2) protection from damaging floods, (3) drainage, and (4) irrigation.

A rapid runoff of water usually results in a loss of both water and soil. The effect of the loss of water is very noticeable during the growing periods of prolonged dry weather. The loss of soil is also very noticeable in De Soto County. The effect is cumulative and the results are to be seen in the eroded and gullied fields of the county. The control of this runoff of water involves many of the good soil management practices. Runoff is retarded by dense growing crops, contour rows, crop residues and organic matter, the ability of the soil to absorb and store water, vegetated waterways, water detention and water storage dams. If the water that falls on the land is to be used effectively then the soil must be planted to an adapted crop, an adequate supply of nutrients must be available, the physical condition of the soil must be suitable for the root systems of the plants, and insects, disease and weeds must be

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[1] An animal unit is equivalent to one mature cow, steer or horse, five hogs, or seven sheep or goats.

[2] Numbers in this column indicate the following: 1, Row crops; 2, Grasses and legumes; and 3, Trees. Thus the figures 2-1-3 indicates the best general use of this soil is for grasses and legumes, next best is for row crops and last for trees.

[3] Workability is the ease of tillage, harvesting and other field operations.

[4] Conservability is the ease with which the soil and plant nutrients can be conserved and productivity and workability maintained.

[5] Not recommended.

*One underscore with this symbol indicates a shallow phase (clay at a depth of 12 to 24 inches); two underscores indicates a moderately shallow phase (clay at a depth of 24 to 36 inches).

controlled. These are the principals upon which good soil management is based, they are also the principals upon which control of runoff is based.

The quantity and rate of runoff increases with an increase in slope on soils that are similar in other respects. In general, crops that effectively retard runoff should be grown more of the time on the steeper than on the less steep slopes of the same soil type.

Protection from floods is a problem in the drainageways and bottoms. Ordinarily the floods occur in the winter or early spring before crops are planted, but occasionally considerable damage is done by the overflowing streams. The risks involved here may be lessened somewhat by controlling the rapid runoff from the hill land, providing adequate channels and by using diversion ditches.

Only in rare instances are drainage ditches required in the uplands. Occasionally an isolated depression or low area requires an artificial ditch. Before ditches are attempted, the capability of the soil should be determined (see table 1 for estimated yields). On some soils, low yields may be expected regardless of how much drainage is provided. The size of the ditch should be determined by the size and cover of the watershed and type of soil. The ditch should be larger for an area without permanent cover or on a soil with poor internal drainage. Ditches should be kept free of silt obstructions by adequate erosion control in the watershed. Ditch banks may be kept from eroding and sloughing off by using vegetation such as kudzu, trees or deep rooted grasses.

Irrigation has not proved very practical in the Brown Loam area of De Soto County. Many of the upland and terrace areas are too steep to be well adapted to irrigation but some of the more level areas, especially the bottoms, could be irrigated.

Some factors to be considered in planning an irrigation system for the Brown Loam area are (1) an adequate inexpensive source of water (2) relief or lay of the land, (3) high enough anticipated returns per acre to justify irrigation equipment, (4) use of a system adapted to the lay of the land that will give an ample supply of water in a short period and (5) the ability to irrigate when the crop needs it. The need for irrigation on most crops is difficult to anticipate. Normally at the present time irrigation could be justified on only the specialized high acre value crop.

Mississippi River Flood Plain or Delta Soil Region General Recommendations

The following discussion of soil management is applicable to all soils in the Delta region of De Soto County. Special recommendations may be found in "Soil Groups of De Soto County Their Use and Management" for Delta Region, page 42.

1. Drainage—Good drainage is an important factor in obtaining the most efficient land use for most soils of the Delta region of De Soto County. However, regardless of how much drainage has been provided, if the crop is not adapted to the soil, low yields may be expected (see table 3 for the estimated average yields of crops on different soil types).

The soil map can be a good guide for locating a system of natural surface drainage for each farm. The long and usually narrow depressional areas (the soil type numbers that begin with 2, for example 210 and 212) make up the natural drainage pattern of each farm. These low swags should be used primarily for the location of ditches and secondarily for the production of some adapted crop. The type and size of ditch used should be governed by the size of the watershed area and the soil types comprising the watershed area. Surface runoff from

Table 2. 1954* recommendations for pasture and forage crops in Brown Loam section.

Pasture Crop	Recommended Varieties	Rate of Seeding per acre	Time of Planting	Fertilization,[1] Lbs./Acre annual application except lime
Bermuda Grass	Common Coastal	5 lbs. or one clump every three feet	Feb. to May	Lime to pH 6.5. 60 lbs. phosphate (P_2O_5). 25 lbs. potash (K_2O) (or 300-400 lbs. 0-16-8) **At least 60 lbs. nitrogen in April.** Additional nitrogen as needed.
Bahia Grass			Feb. to April or Aug. to Oct.	Lime to pH 6.5. 50 lbs. phosphate (P_2O_5). 25 lbs. potash (K_2O) (or 300-400 lbs. 0-16-8) Topdress after germination with 30 lbs. nitrogen. Additional nitrogen as needed.
Millet	Pearl Cattail Starr	10 lbs. in rows 25 lbs. broadcast	Seeded by June 15	Lime to pH 6.5. 60 lbs. phosphate (P_2O_5). 25 lbs. potash (K_2O). (or 600 lbs. 5-10-5). Apply 30 lbs. of nitrogen at planting time followed by 30 lbs. nitrogen each month of grazing.
Sudan	Tift, Sweet	Same as millet	Seeded by June 15	Same as for Millet
Alfalfa	Buffalo, Kansas Oklahoma, Ranger Atlantic and Williamsburg	20 lbs. per acre	Seeded by Oct. 15	Establishment: Lime to pH 6.5. 200 lbs. phosphate (P_2O_5). 100 lbs. (K_2O) (or 1200 lbs. 0-16-8). Apply 10 lbs. borax. Maintenance: 100 lbs. phosphate, 100 lbs. potash (or 700 lbs. 0-14-14) 10 lbs. borax.)
Lespedeza	Kobe, Climax Common	25 lbs.	Feb.-March	Lime to pH 6.5. 60 lbs. phosphate (P_2O_5). 25 lbs. potash (K_2O) (or 300-400 lbs. 0-16-8).

Table 2. 1954* recommendations for pasture and forage crops in Brown Loam section.

Pasture Crop	Recommended Varieties	Rate of Seeding per acre	Time of Planting	Fertilization,[1] Lbs./Acre annual application except lime
Tall Fescue	Alta Kentucky 31	5-10 lbs.	Sept. 1-Oct. 15	Lime to pH 6.5. 60 lbs. nitrogen and 60 lbs. phosphate (P_2O_5). 60 lbs. potash (K_2O). (or 750 lbs. 8-8-8) Additional nitrogen as needed.
Tall Fescue & White Clover	Tall Fescue: Alta, Kentucky 31; White Clover: Ladino, La. S-1 or other adapted strains	2 lbs. clover to 5-10 lbs. fescue	Sept. 1-Oct. 15	Establishment: Lime to pH 6.5. 60 lbs. nitrogen and 100 lbs. phosphate (P_2O_5). 100 lbs. potash (K_2O) (or 1000 lbs. 5-10-5) Maintenance: 60 lbs. nitrogen, 60 lbs. phosphate, and 60 lbs. potash. (or 750 lbs. 8-8-8)
Ryegrass-Clover	Ryegrass: Domestic Italian, American, Annual Clover: Ladino, La. S-1 or other adapted strain—Common and Reseeding Crimson	20-25 lbs. ryegrass, 2 lbs. all varieties White Clover or 25 lbs. Crimson	Sept. 1-Oct. 15	Lime to pH. 6.5. 60 lbs. nitrogen and 100 lbs. phosphate (P_2O_5). 50 lbs. potash (K_2O). (or 500 lbs. 5-10-5.)
Small grain Clover	Small grain: Oats, wheat, rye, barely Clover: Ladino, La. S-1 or other adapted strain—Common and Reseeding Crimson	120 lbs. small grain 2 lbs. all varieties White Clover or 25 lbs. all crimson	Sept. 1-Oct. 15	Same as for Ryegrass-Clover.
Ryegrass	Italian, Annual Domestic, American	20-25 lbs.	Sept. 1-Oct. 15	Lime to pH 6.5. 60 lbs. nitrogen and 60 lbs. phosphate (P_2O_5). 25 lbs. potash (K_2O). (or 700 lbs. 8-8-4). Additional nitrogen as needed.

Table 2. 1954* recommendations for pasture and forage crops in Brown Loam section.

Pasture Crop	Recommended Varieties	Rate of Seeding per acre	Time of Planting	Fertilization[1], Lbs./Acre annual application except lime
Crimson Clover	Common and reseeding	20-30 lbs.	By Sept. 1	Lime to pH 6.5. 60 lbs. phosphate (P_2O_5). 25 lbs. potash (K_2O). (or 300-400) lbs. 0-16-8). For seed production, 10 lbs. borax.
White Clover	Ladino, La. S-1 or other adapted strains	2 lbs.	Sept. 1-Oct. 15	Establishment: Lime to pH 6.5. 100 lbs. phosphate (P_2O_5). 50 lbs. potash (K_2O). (or 600 lbs. 0-16-8) For seed production: 10 lbs. borax. Maintenance: 60 lbs. phosphate, 25 lbs. potash. (or 300-400 lbs. 0-16-8) 10 lbs. borax.
Red Clover	Kenland and Common	8-12 lbs.	Sept. 15-Oct. 15	Same as for White Clover.
Dallis Grass	Domestic, Imported	10 lbs. live Dallis grass seed	Feb.-April; Aug.-Oct.	Lime to pH 6.5. 60 lbs. phosphate (P_2O_5). 25 lbs. potash (K_2O). or 300-400 lbs. 0-16-8. Top dress after germination with 30 lbs. nitrogen. Additional nitrogen as needed.
Dallis Grass-Lespedeza	Dallis Grass: Domestic, Imported Lespedeza: Common, Kobe, Climax	10 lbs. live Dallis grass seed 15 lbs. lespedeza	Dallis Grass : Feb.-Apr.; Aug.-Oct. Lespedeza: Feb.-Mar.	Establishment: Lime to pH 6.5. 100 lbs. phosphate (P_2O_5). 50 lbs. potash (K_2O). or 600 lbs. 0-16-8. Maintenance: 60 lbs. phosphate, 25 lbs. potash (or 300-400 lbs. 0-16-8).
Dallis Grass-Clover	Dallis Grass: Domestic, Imported White Clover: Ladino, La. S-1 or other adapted strain	15 lbs. Dallis 2 lbs. White Clover	Dallis Grass Feb.-Apr.; Aug.-Oct. White Clover: Sept. 1-Oct. 15	Same as for Dallis Grass-Lespedeza.

Table 2. 1954* recommendations for pasture and forage crops in Brown Loam section.

Pasture Crop	Recommended Varieties	Rate of Seeding per acre	Time of Planting	Fertilization,[1] Lbs./Acre annual application except lime
Lespedeza Sericea		30-35 lbs. (hulled)	Feb. 1-July 1	Same as for Lespedeza,
Austrian Winter Peas		50 lbs.	Sept. 15-Oct. 15	Same as for Lespedeza,
Wild Winter Peas	Known as Wild winter peas, Caley peas, Singletary pea	50 lbs.	Sept. 1-Oct. 15	Same as for Lespedeza,
Cow Peas	For seed: Iron, Chinese Red, Blackeye No. 5, Crowder, Dixielee; For Hay: Brabham, New Era, Clay	25 lbs. if planted by rows. 60 lbs. broadcast	May 15-June 15	Same as for Lespedeza,
Kudzu		500-1000 crowns	Before May 1	Same as for Lespedeza,
Vetch	Hairy	30 lbs.	Sept. 15-Oct. 15	Same as for Lespedeza,
Oats	Delta Red 88 Madison Co. Nortex 107, Victorgrain 48-93, Arlington, Mustang	For forage: 128 lbs. (4 bu.) For grain: 80 lbs. (2½ bu.)	For forage: Sept. 1-Oct. 1 For grain: Oct. 1-Oct. 15	For forage: Lime to pH 6.5. 60 lbs. nitrogen, 60-120 lbs. phosphate (P_2O_5). On soils known to be low in potash, apply 25 lbs. potash (K_2O). Topdress in Feb. with 60 lbs. nitrogen. For grain: Apply 20 lbs. nitrogen and 20 lbs. phosphate (P_2O_5) prior to seeding. Topdress with 40 lbs. nitrogen about March 1.
Rye	Abruzzi	For forage: 100 lbs.	Same as for Oats	Same as for Oats.
		For grain: 80 lbs.	Same as for Oats	Same as for Oats.

Wheat	Atlas 66, Coker 47-27 Chancellor,	For forage: 100 lbs.	Same as for Oats	Same as for Oats.
		For grain: 80 lbs.	Same as for Oats	Same as for Oats.
Barley	Kenbar	For forage: 100 lbs.	Same as for Oats	Same as for Oats.
		For grain: 80 lbs.	Same as for Oats	Same as for Oats.

[1] In case of all mixed fertilizers the equivalent amounts of other grade, ratios or mixtures may be substituted.

*Changes may be made in the future based on latest research findings, therefore, these must be regarded as current recommendations.

sandy soils is much less than the runoff from clay soils; therefore, the clay soil areas will require more and larger ditches. Occasionally, it is necesary to cut ditches across ridges to drain isolated low areas. However, this practice should be avoided as much as possible since the absence of cross ditches results in the longer row essential to mechanized farming.

2. Field Layout and Row Direction—When practical, field boundaries should be placed on soil boundaries that separate soil types requiring different treatment. Fertilizer application and other management practices suitable for the entire field can then be planned.

Where possible, roads and turnrows should be located on soil boundaries. Roads that cross soil boundaries, rather than follow them, tend to divide the field into smaller units undesirable for mechanized farming. The boundaries of soils on C (6 to 10%) and D (10% or over) slopes, as well as escarpments and stream banks, are ideal locations for roads.

Row direction is important and should be governed by the soil type, slope of the land, and method of tillage. Soils on level topography require row direction that allows the best possible runoff. On poorly to somewhat poorly drained soils the row direction should be such that each row will carry the excess water to an outlet. Of course, this should not be done when there is danger of erosion. The somewhat poorly to somewhat excessively drained soils (soil type numbers where the middle digit is 3, 4, 5 or 6) should have rows running on the contour in order to conserve moisture and prevent excessive erosion. Generally, this means the rows should parallel the natural low swags, natural streams, bayous, and ridges.

The above suggestions usually make it possible to lay out permanent fields with larger areas and longer rows. These long rows over uniform soil tend to make mechanized farming more efficient.

3. Fertilization—Fertilizer is very important in the Delta to obtain maximum yields from crops; however, the number of fertilizer elements needed for the majority of the soils of this area is much smaller than in the Brown Loam area.

Nitrogen has long been recognized as the most lacking fertilizer element in Delta soils of De Soto County. Addition of nitrogen and organic matter to the soil increases the productivity for non-legume crops. Legume crops, manure and crop residues are good sources of organic matter. Vetch and bur clover are well adapted to the silty and sandy soils (soil types with numbers ending in 5, 6, or 7). Vetch and winter peas are both adapted to soils with high clay content (soil types with numbers ending in 2, 3, or 4).

However, growing of winter legumes on clay soils to be turned under in the spring is very hazardous. The shallow surface layers of these soils make it difficult to cover a rank growth of winter legumes well enough for rapid decomposition. Usually, most of these fine textured soils are broken in the fall so that it is not necessary to disturb the seed bed in the spring. Spring breaking of these soils usually leaves them in a cloddy condition throughout most of the growing season. For these clay soils, a rotation where summer legumes, such as soybeans, are grown for nitrogen and organic matter, is sometimes desirable. Where it is not practical to grow leguminous crops, a commercial nitrogenous fertilizer must be used on all non-legume crops if maximum yields are to be obtained.

Depressional areas, where water accumulates from higher surrounding land, maintain a higher nitrogen level and do not require additionals of large amounts of commercial nitrogen. In fields where numerous small depressions occur more efficiency can be obtained by leaving fertilizer off rows located in depressions and applying more to rows on the ridges.

Many soils of the De Soto County Delta are acid, or sour. Many crops are acid tolerant—for example, cotton and corn. Clovers and most other legumes grow best on soils that have only a slightly acid, neutral or slightly alkaline reaction. (Soils with these reactions are usually referred to as being sweet, these soils are indicated by the first number of the symbol being 1 as 156A1.) Soils that are acid, or sour, should receive applications of lime until the reaction reaches the above mentioned sweet condition, if any of the legume crops are to be grown. Soils with high clay content in the top soil will require much more lime to bring them to the desired reaction level than sandy soils with the same degree of sourness.

Experimental work with phosphorus (phosphate) and potassium (potash) fertilizers on most Delta soils has shown little need for these minerals. This does not mean that there are no areas in the Delta area of the county deficient of these minerals. This, also, does not mean that in years to come Delta soils will not be depleted of their phosphate and potash supply. The sediments from which the soils of the De Soto County Delta were formed were rich in these minerals, and the past continuous cotton type farming has removed little of these elements. If a change should occur in the type of agriculture in which more hay and grain crops would be grown these elements would be removed from the soil much faster. These deficiencies first show up in the soils of the old natural levees (low terrace) group, and it is on these soils that the farmer should watch for symptoms and reduced yields in his crops. In many cases reduced yields are caused by the poor physical condition of the soil. This condition must be corrected before crops can efficiently use the available fertilizer.

When farmers think that their soils may be low in phosphorus or potassium, or if they decide to lime their land and want to know the approximate amount to apply, they should have their soil tested in the quick-test soils laboratory and use this information for further studies in the field. If the test shows an existing deficiency in phosphorus or potassium and yields have been declining over a period of years, the farmer should then apply the recommended fertilizer treatment on 10 to 15 rows in the field, or a small plot if in a pasture. It is important that 10 to 15 rows next to the treated rows be left as a check on which no phosphorus or potassium is applied. After comparing the results between the treated and untreated plots, the farmer is then in position to decide whether or not he should use phosphorus and potassium fertilizers on a larger scale. Consult some of the agricultural workers in the county regarding how to collect samples for soil analysis.

4. Irrigation—Irrigation of row crops is in the experimental stage with good possibilities for the future. Rice irrigation has been successful.

With the type of irrigation required for rice production, the subsoil is important. There must be a subsoil layer which will retard or prevent the downward movement of water. The Alligator and Sharkey soils are ideal for this type of irrigation. It also can be practiced on the Forestdale, Tunica, and Mhoon soils without serious loss of water.

Most all soils of the De Soto County Delta section, with the exception of those on steep slopes, may be irrigated for pasture and row crops. Should you plan to irrigate pasture and row crops, keep the following points in mind.

1. Irrigate the crops as they need it. Once the ground is badly cracked it is difficult and costly to seal these cracks, and the plants' root systems have already been damaged. Often row crops start a second growth after irrigation when it has been delayed for a long period of time. This second growth usually reduces the yields of these crops.

2. Use a system of irrigation where several inches of water can be applied in a fairly short time so that it will be comparable to a normal, good rain. Irrigation with only small amounts of water usually gives no beneficial results.

Regardless of the crop you plan to irrigate, be sure to have an abundant source of water before making definite plans for irrigation. When several farmers are irrigating large areas with water from the same lake or small stream, the water supply is sometimes exhausted during dry seasons.

Know the Specific Problems of Your Soils

Study your soil map and identify all of the different types of soil on your farm. After they have been identified, study their descriptions in this bulletin and the estimated average yields and proposed land use in tables 1 and 3.

Most farms have soils varying widely in adaptability to different crops. Some may be excellent pasture land, but a poor risk for cotton production. By using the soil map as a guide, soils adapted to similar crops and requiring similar management practices may be blocked off and put to the same land use.

Each soil condition has problems which may or may not be general in all of your soils. All may have the same surface texture; but the internal drainage could vary from poor to excellent. This variability can affect crop adaption. On the other hand, the internal drainage may be the same on all your soils, but surface textures may vary widely. These variations can affect the choice of crops and methods of tillage.

Many fields in De Soto County have

Table 3. Estimated average yields of principal crops under good management and proposed general land use recommendations for the Delta soils of De Soto County.

Soil symbol	Soil group	Soil name	Cotton lint (lbs. per acre)	Corn (hybrid) (bu. per acre)	Soybeans (bu. per acre)	Pasture (ac. per animal unit[1])	Proposed land use[2]	Workability[3]	Conservability[4]
100	----	Alluvial soils (unclassified, wooded area unprotected by levee)	[5]	----	----	----	--------	----------	------
123A°	D4b	Mhoon silty clay, level phase	375	55	30	2.8	3-2-1	Poor	Very good
123A1	D4a	Mhoon silty clay, nearly level phase	400	65	30	2.6	2-3-1	Poor	Very good
124A1	D3	Mhoon silty clay loam, nearly level phase	400	70	30	2.6	2-1-3	Fair	Very good
133A1	D2a	Commerce silty clay, nearly level phase	500	70	30	2.6	1-2	Poor	Very good
133B1	D2a	Commerce silty clay, gently undulating phase	550	70	30	2.5	1-2	Poor	Good
134A1	D2a	Commerce silty clay loam, nearly level phase	700	75	30	1.9	1-2	Good	Excellent
134B1	D2a	Commerce silty clay loam, gently undulating phase	700	75	30	1.9	1-2	Good	Good
135A1	D1a	Commerce silt loam, nearly level phase	725	80	30	1.8	1-2	Excellent	Excellent
135B1	D1a	Commerce silt loam, gently undulating phase	750	85	30	1.7	1-2	Excellent	Very good
135C1	D1b	Commerce silt loam, undulating phase	450	65	30	2.0	2-1	Excellent	Fair
136A1	D1a	Commerce very fine sandy loam, nearly level phase	775	85	30	1.7	1-2	Excellent	Excellent
136B1	D1a	Commerce very fine sandy loam, gently undulating phase	750	85	30	1.7	1-2	Excellent	Excellent
156A1	D1a	Robinsonville very fine sandy loam, nearly level phase	825	90	35	1.5	1-2	Excellent	Excellent
156B1	D1a	Robinsonville very fine sandy loam, gently undulating phase	825	90	35	1.5	1-2	Excellent	Excellent
170A1	D5	Crevasse soils, nearly level phase	------	----	----	5.0	2-1	Excellent	Good
170B1	D5	Crevasse soils, gently undulating phase			----	5.0	2-1	Excellent	Good
212A+	D4b	Dowling clay	250	25	15	---	3-2-1	Very poor	Good
213A+	D4b	Dowling silty clay	250	25	15		3-2-1	Very poor	Good
210A+	D3	Dowling soils	300	30	20	3.3	2-1-3	Poor	Good
235A+	D1a	Souva silt loam	500	60	30	3.0	1-2	Good	Very good
312A1	D4a	Alligator clay, nearly level phase	375	30	25	3.0	2-3-1	Poor	Very good
312B1	D4a	Alligator clay, gently undulating phase	400	30	25	3.0	2-3-1	Poor	Very good
313A°	D4b	Alligator clay, nearly level phase	375	30	25	3.5	3-2-1	Poor	Very good
313A1	D4a	Alligator silty clay, nearly level phase	400	30	25	3.5	2-3-1	Poor	Very good
313B1	D4a	Alligator silty clay, gently undulating phase	425	30	25	3.0	2-3-1	Poor	Very good
314A1	D3	Alligator silty clay loam, nearly level phase	450	40	25	3.5	2-1-3	Fair	Very good
322A°	D4b	Sharkey clay, level phase	375	30	25	3.5	2-3-1	Poor	Very good
322A1	D4a	Sharkey clay, nearly level phase	400	30	25	3.5	2-3-1	Poor	Very good

322B1	D4a	Sharkey clay, gently undulating phase	400	35	25	3.0	2-3-1	Poor	Very good
323A1	D4a	Sharkey silty clay, nearly level phase	375	35	25	3.5	2-3-1	Poor	Very good
324A1	D3	Sharkey silty clay loam, nearly level phase	400	40	25	3.0	2-1-3	Fair	Very good
324B1	D3	Sharkey silty clay loam, gently undulating phase	425	40	25	3.0	2-1-3	Fair	Very good
325+A	D3	Sharkey silt loam, nearly level phase	450	45	25	2.8	2-1-3	Good	Very good
325+B	D3	Sharkey silt loam, gently undulating overwash phase	450	45	25	2.5	2-1-3	Good	Very good
326+B	D3	Sharkey very fine sandy loam, gently undulating overwash phase	450	45	25	2.5	2-1-3	Very good	Very good
333A1	D2a	Tunica silty clay, nearly level phase	500	40	30	2.2	1-2	Poor	Very good
333B1	D2a	Tunica silty clay, gently undulating phase	500	40	30	2.2	1-2	Poor	Very good
423A1	D4a	Forestdale silty clay, nearly level phase	375	35	20	2.6	2-3-1	Poor	Very good
424A1	D3	Forestdale silty clay loam, nearly level phase	450	45	25	2.6	2-1-3	Good	Very good
424B1	D3	Forestdale silty clay loam, gently undulating phase	450	45	25	2.6	2-1-3	Good	Very good
425A1	D3	Forestdale silt loam, nearly level phase	475	50	25	2.5	2-1-3	Good	Very good
433A1	D2a	Dundee silty clay, nearly level phase	500	55	30	2.4	1-2	Poor	Excellent
433B1	D2a	Dundee silty clay, gently undulating phase	500	55	30	2.4	1-2	Poor	Very good
433C2	D2b	Dundee silty clay, eroded undulating phase	450	50	25	2.6	2-1	Poor	Fair
434A1	D2a	Dundee silty clay loam, nearly level phase	550	65	30	2.4	1-2	Good	Very good
434B1	D2a	Dundee silty clay loam, gently undulating phase	550	65	30	2.6	1-2	Good	Good
434C1	D2b	Dundee silty clay loam, undulating phase	475	60	28	2.9	2-1	Good	Fair
434C2	D2b	Dundee silty clay loam, eroded undulating phase	450	50	25	3.0	2-1	Good	Fair
435A1	D1a	Dundee silt loam, nearly level phase	650	65	35	2.2	1-2	Excellent	Excellent
435B1	D1a	Dundee silt loam, gently undulating phase	600	60	35	2.3	1-2	Excellent	Very good
435C1	D1b	Dundee silt loam, undulating phase	450	65	30	2.4	2-1	Very good	Good
435C2	D1b	Dundee silt loam, eroded undulating phase	425	60	25	2.6	2-1	Very good	Fair
436A1	D1a	Dundee very fine sandy loam, nearly level phase	725	70	35	2.4	1-2	Excellent	Excellent
436B1	D1a	Dundee very fine sandy loam, gently undulating phase	700	65	35	2.5	1-2	Excellent	Very good
436B2	D1a	Dundee very fine sandy loam, eroded gently undulating phase	600	60	30	2.6	1-2	Excellent	Good
436C2	D1b	Dundee very fine sandy loam, eroded undulating phase	450	55	25	3.0	2-1	Very good	Fair
445A1	D1a	Dubbs silt loam, nearly level phase	800	90	35	2.0	1-2	Excellent	Excellent
445B1	D1a	Dubbs silt loam, gently undulating phase	775	80	35	2.3	1-2	Excellent	Excellent
445C1	D1b	Dubbs silt loam, undulating phase	500	85	35	2.0	2-1	Excellent	Very good
445C2	D1b	Dubbs silt loam, eroded undulating phase	475	70	30	2.5	2-1	Excellent	Good
446A1	D1a	Dubbs very fine sandy loam, nearly level phase	800	90	35	2.0	1-2	Excellent	Excellent

	Soil group	Soil name	Cotton lint (lbs. per acre)	Corn (hybrid) (bu. per acre)	Soybeans (bu. per acre)	Pasture (ac. per animal unit[1])	Proposed land use[2]	Workability[3]	Conservability[4]
446B1	D1a	Dubbs very fine sandy loam, gently undulating phase	800	90	35	2.3	1-2	Excellent	Excellent
446C2	D1b	Dubbs very fine sandy loam, eroded undulating phase	500	80	35	2.5	2-1	Excellent	Fair
456A1	D1a	Bosket very fine sandy loam, nearly level phase	800	90	32	1.6	1-2	Excellent	Excellent
456B1	D1a	Bosket very fine sandy loam, gently undulating phase	750	75	30	1.8	1-2	Excellent	Very good
456C2	D1b	Bosket very fine sandy loam, eroded undulating phase	500	65	22	2.0	2-1	Excellent	Good
460D2	D5	Beulah-Dundee soils, eroded sloping phase	400	50	20	2.3	2-1	Good	Poor
466A1	D1a	Beulah very fine sandy loam, nearly level phase	550	70	18	2.6	1-2	Excellent	Excellent
466B1	D1a	Beulah very fine sandy loam, gently undulating phase	550	70	15	2.8	1-2	Excellent	Excellent
466C2	D1b	Beulah very fine sandy loam, eroded undulating phase	450	50	12	3.2	2-1	Excellent	Good
467B1	D1a	Beulah fine sandy loam, gently undulating phase	550	70	15	3.0	1-2	Excellent	Excellent
467C2	D1b	Beulah fine sandy loam, eroded undulating phase	45	50	12	3.0	2-1	Excellent	Good

[1] An animal unit is equivalent to one mature cow, steer or horse, five hogs, or seven sheep or goats.

[2] Numbers in this column indicate the following:– 1, Row crops, principally cotton and corn; 2, Close growing crops for grain, hay, pasture or soil improvement; 3, Rice and soybeans. Thus the figures 3-2-1 indicates that the best recommended use of this soil is rice and soybeans, next best for close growing crops and last for row crops.

[3] Workability is the ease of tillage, harvesting and other field operations.

[4] Conservability is the ease with which the soil and plant nutrients can be conserved and productivity and workability maintained.

[5] Not recommended.

two or more soils with widely varying characteristics that require different types of crops and management. When the area of one soil is very small it is often necessary to farm it the same as the surrounding area. Otherwise each soil type can be managed separately and put to its best land use.

Soil Groups of De Soto County, Their Use and Management

Since the county is divided into two soil areas, each with different use and management problems, the soils of each area are grouped and discussed separately.

Brown Loam Area

In this soil area seven soil groups or classes of land are recognized. This classification is based on management requirements and the ability of the land to produce the major crops.

These groups are as follows: 1, the most productive land for row crops; 2, good cotton land; 3, cotton and pasture land; 4, pasture and hay land; 5, hardwood tree, pasture and hay land; 6, temporary and permanent pasture land; and 7, tree and kudzu land.

Group 1a. The soils of this group range from somewhat poorly to well drained internally with the majority of them being moderately well to well drained. They have silt loam surfaces easily worked over a rather wide range of moisture conditions. They occur in the bottoms and along the long narrow drainageways, upland depressions and toe slopes bordering the bottoms. Level areas (0 to 2 percent) predominates with some areas being gently undulating a few undulating in topography.

Protection from flooding is the major problem with these soils. Normally these floods occur in winter or early spring before crops are planted and very little damage is done. Adequate ditches must be provided for the normal flow of water across these areas. In many areas diversion ditches are helpful to keep surface water from the upland areas from washing across and causing damage to the crops and soils of the bottoms.

These soils are excellent for both cotton and corn. They are also very good for sorghum, soybeans, hay and pasture crops. Winter cover crops and summer legumes for green manure crops should be grown where practical to increase fertility and improve the physical characteristics of the soil.

The soils of this group are: 555, 535[1], 535B+, 655, 655B+, 635 and 635B+.

Group 1b. The soils of this group are somewhat poorly to moderately well drained and are found in the bottom areas. They have silty clay loam surfaces which are heavier textured than the soils of group 1a. They are somewhat more difficult to till than the soils with a silt loam surface because of the tendency to get hard when dry and sticky when wet.

Adequate artificial drainage must be provided for these soils. The moisture range for easy cultivation is not as wide as for the silt loam surface soils.

These soils are not quite as well adapted to cotton and corn as those of group 1a, but they are very well suited to soybeans, sorghum, hay and pasture crops. Crop residues and both winter and summer legumes should be turned under to maintain organic matter, improve tilth and fertility of the land.

The soils of this group are as follows: 534[2].

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[1] One underscore under the symbol on the map indicates a shallow phase (clay at a depth of 12 to 24 inches); two underscores indicate a moderately shallow phase (clay at a depth of 24 to 36 inches).

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[2] This symbol underscored one time on the map indicates a shallow phase (clay at a depth of 12 to 24 inches); two underscores indicate a moderately shallow phase (clay at a depth of 24 to 36 inches).

Group 1c. The soils of this group are composed of sand, silt and some fine gravel in places. The sand and gravel have washed from the gullied upland areas and have been deposited along the small drain-ways or bottoms to form this group. The textures are not uniform throughout a given mapping unit of these soils. The sand and small gravel layers may occur on the surface or in the subsoil and these layers may vary in thickness.

These soils are easily tilled. Adequate drainage ditches must be provided to carry excess water from these soils and the surrounding uplands. One of the problems is to keep the ditches and streams from overflowing and depositing deep beds of sand on these soils.

Cotton and corn are well adapted to this land but it is also suited to pasture and hay crops. Grasses do especially well.

The soils of this group are as follows: 630, 630B+, 630C+, 530, and 5356.

Group 2a. This group is the best of the soils of the upland and terraces. The topography is gently undulating (slope 2 to 5 percent). They have a friable silt loam surface from 2 to 8 inches thick and are moderately well to well drained internally. The subsoil is somewhat easily penetrated by plant roots, water and air. These soils occur on the ridgetops of both the upland and the stream terraces.

Rows should be run on the contour and close growing crops for hay, pasture or soil improvement should be grown every other year. Row crops may be grown more often provided crop residues and a good growth of winter legumes are turned under each year.

These soils are excellent for cotton, very good for corn and are well suited for small grain, soybeans, sorghum, hay and pastures. Organic matter for improving the fertility and physical characteristics may be had by turning under crop residues and both winter and summer legumes where practical.

The soils of this group are as follows: 955B2, 955BO, 945B1, 945B2, 945BO, 845B1, and 845B2.

Group 2b. These soils are not as well drained internally as those of group 2a. A compact grayish hardpan layer beginning at a depth of 20 to 30 inches somewhat restricts the downward movement of water. These soils have a friable silt loam surface about 2 to 8 inches thick that is easily tilled. They are found on the more level ridgetops of the uplands and the terraces. Most of the areas are gently undulating (slope 2 to 5 percent) with some few areas being level (0 to 2 percent).

Rows should be run on the contour and close growing crops should be rotated with row crops to prevent excessive erosion. Organic matter may be added by turning under winter cover crops and summer legumes.

These soils are adapted to about the same crops as those of group 2a. They are very good for cotton, good for corn and are adapted to soybeans, sorghum, hay and pasture crops.

The soils of this group are as follows: 835A1, 835B1, 835B2, 935B1 and 935B2.

Group 3a. These soils are moderatewell to well drained internally and have moderate to light-textured surfaces. The original or uneroded surfaces are all friable silt loams. Many of the areas are severely eroded, having practically all of the 6 to 8 inch original silt loam surface removed and in places part of the subsoil, leaving the heavied textured (silty clay loam) subsoil exposed on the surface. An occasional deep gully not easily crossed with heavy machinery (indicated by the symbol (7)) may be found in some of the areas. These soils occur on both older stream terraces and uplands. The topography ranges from gently undulating to gently rolling (slope 2 to 12 percent).

The major problems on these soils is the control of erosion. This may be done by running the rows on the contour and keeping the land covered with vegetation as much of the time as possible. A rotation of one year of row crops to two years of close growing crops for hay, pasture or soil improvement is suggested. The gullies should receive individual treatment, such as filling up by pushing in with machinery, sodding with heavy grass sod and by using small check-dams. The lighter textured, more porous silt loam textured surfaces will absorb and sold more water than the eroded heavier textured surfaces. The heavy textured soils especially should have plenty of organic matter in the form of crop residues and green manure crops to help keep the soil more open and porous.

For row crops these soils are best adapted to cotton production. They are well suited to hay, small grain, and pasture crops. Turning under winter cover crops and summer legumes will improve the fertility and physical properties of the soil. Hay and pasture recommendations may be found on page 23.

The soils of this group are as follows: 954B3, 844B3, 944B3, 944B3(7), 955C1, 955C2, 945C1, 945C2, 954C3(7), 844C3, 944C3(7), 9546C3, 9448C3(7), 955D2(7), 945D1, 945D1(7), 945D2, 945D2(7).

Group 3b. The soils of this group have a compact hardpan layer at a depth of about 20 to 30 inches from the surface. They have a moderate to light textured surface (silt loam and silty clay loam). Severe sheet erosion in many areas has removed the friable silt loam surface leaving the silty clay loam subsurface soil exposed. These soils are moderately well drained internally and the surface runoff is moderate to somewhat rapid.

The main problem is the control of erosion which may be accomplished by contour rows and keeping a vegetative cover on the soil as much of the time as possible. A rotation of one year of row crops to two years of close growing crops for hay, pasture or soil improvement is suggested. As much organic matter as possible should be turned under in the form of winter cover crops, summer legumes and crop residues so as to increase fertility and cause the surface to be more open and porous to receive and store additional water for the use of the crops.

The water storage capacity is not quite as much on these soils as on the soils of group 3a, neither do deep rooted plants do as well on these soils. For row crops they are best adapted to cotton. They are well adapted to hay, small grain and pasture crops. Winter cover crops and summer legumes should be turned as often as practical to improve the fertility, structure and other physical properties of the soil.

The soils of this group are as follows: 834B3, 934B3, 934B3(7), 835C1, 835C2, 935C2, 834C3, , 834C3(7), 934C3, 934C3(7), 835D2(7), 935D1, 935D1(7), 935D2, and 935D2(7).

Group 4. The soils of this group have shallow rather light yellowish subsoils and a grayish compact hardpan layer beginning at a depth of about 12 to 20 inches. They are somewhat poorly drained internally and have moderate surface runoff. The severely eroded areas have a heavier textured surface than the other areas because erosion has removed the lighter textured surface leaving the silty clay loam subsoil exposed. These soils occur on gently undulating (slope, 2 to 5 percent) topography on both the old stream terraces and the uplands.

Rows should be run on the contour and a rotation which includes one year of row crops with three years of close growing crops for hay, pasture or soil improvement is suggested. Winter cover crops and summer legumes should be

Table 4. 1954* Delta pasture crop recommendations.

Pasture Crop	Recommended varieties	Rate of Seeding per acre	Fertilizer	Time of planting
Alfalfa	Buffalo Kansas Common Okla. Common	10-20 lbs.	Test soil for lime, phosphorus, and potash	Oct. 1-15
Bermuda grass	Common Coastal	5 lbs. or sprig	60 lbs. nitrogen	Mar. 1-Apr. 1
Dallis grass	Imported or Domestic	10 lbs. live seed	30 lbs. nitrogen after germination	Oct. 1-Nov. 1
Fescue and ladino	Kentucky 31	5-10 lbs. Fescue 1-2 lbs. Ladino	30 lbs. nitrogen at planting, 60 lbs. for winter grazing	Oct. 1-Nov. 1
Red clover	Kenland Common	10-15 lbs. seed alone or in small grains	Test soil for lime, phosphorus, and potash	Oct. 1-Nov. 1
Ladino clover		1-2 lbs. seed with grass	Test soil	Oct. 1-Nov. 1
White clover		2-4 lbs. seed with grass	Test soil	Oct. 1-Nov. 1
Crimson clover	Hard seeded for volunteer crop	12-15 lbs.	Test soil for lime, phosphorus, and potash	Oct. 1-Nov. 1
Sudan grass	Tift Sweet	6-10 lbs. in 38" to 40" rows	60 lbs. nitrogen	June 1-20
Persian clover	Not recommended			
Hop clover	Not recommended			
Lespedeza	Korean or Climax	20-25 lbs. seed in small grains		Feb. 15-Mar. 15
Grain sorghum	Martin	4-10 lbs. in 38" to 40" rows	30-45 lbs. nitrogen	June 1-July 1
Oats	Delta Red 88 Nortex 107 Delair	3 bushels 2½ bu. for grain	60 lbs. nitrogen in Sept. for winter grazing 30-40 lbs. nitrogen in Feb. for grain	For grazing, early September For grain, mid-October
Ryegrass	Annual	25-30 lbs.	60 lbs. nitrogen	Sept. 1-15

grown and turned under where practical.

These soils are best adapted to pasture, hay and soybeans. Cotton and corn may be grown in a long time rotation with these other crops.

The soils of this group are as follows: 825B1, 825B2, 925B1, 925B2, 824B3, and 924B3.

Group 5a. The soils of this group are very shallow and have grayish subsoils not easily penetrated by water, air or plant roots. They are located on the lower elevations of the old stream terraces and the broad flat and slightly depressed areas of the uplands. The predominant relief is level (slope, 0 to 2 percent) with some areas being gently undulating (slope, 2 to 5 percent). The surface texture of all these soils is a silt loam with somewhat heavier subsoils and compact hardpan layers at shallow depths. The water holding capacity of these soils is very low. They are very wet during the periods of heavy rainfall and very dry during the drier periods of the year.

Since little water penetrates down through these soils, surface drainage must be provided in the form of V- and W-ditches.

The best uses for these soils are for pasture and forest, with possibly some hay, especially lespedeza, in better drained areas. Row crops are not recommended although during favorable seasons a fair yield of cotton or corn may be produced.

The soils of this group are as follows: 825A1, 925A1, 815A1, 815B1, 815B2, and 915A1.

Group 5b. The soils of this group are the somewhat poorly to poorly drained soils of the bottoms and the small drainageways. They have moderate textured surfaces and gray subsoils. The predominant relief is level, although a few areas are gently undulating (slope ranges from 0 to 5 percent).

Water stands for long periods of time over most of these soils and extensive

Wheat	Chancellor Atlas 66 Coker 47-27	1¼ bu. 1½ bu. for grain	Same as for oats	Same as oats
Johnson grass and red colver mixture		10-15 lbs. spring 10 lbs. fall	60 lbs. nitrogen	April 1-June 1 Oct. 1-Nov. 1 after Johnson grass established

*Changes may be made in the future based on latest research findings, therefore, these must be regarded as current recommendations.

Table 5. Cropping system, Seeding and fertilizer recommendations for the Delta farm.

Field No.	Acres	Crops	Seeding recommendations	Fertilizer recommendations
1	50	Cotton continuously followed by vetch or bur clover	Cotton, 1 bushel per acre. Vetch, 30 lbs. in September. Bur clover, 10-15 bushels unhulled in July or August	Good growth of vetch or clover plus 30 pounds of nitrogen or 75 pounds nitrogen
2a	16	Cotton 2 years followed by 2 years soybeans	Cotton, 1 bushel per acre Soybeans, 1 bushel per acre	Cotton, 80 pounds nitrogen before planting
2b	16	Soybeans 2 years followed by 2 years cotton	Cotton, 1 bushel per acre Soybeans, 1 bushel per acre	Cotton, 80 pounds nitrogen before planting
3a	36	Grain sorghum 1 year, soybeans 1 year	Soybeans, 1 bushel per acre Grain sorghum, 5-7 pounds per acre	Grain sorghum, 30 pounds nitrogen
3b	36	Soybeans 1 year, Grain sorghum 1 year	Soybeans, 1 bushel per acre Grain sorghum, 5-7 pounds per acre	Grain sorghum, 30 pounds nitrogen
4	70	Rice 3 years, soybeans 3 years	Soybeans, 1 bushel per acre (rows). Rice, 2 to 3 bushels per acre	Rice, 50 to 65 pounds nitrogen second and third year
5	125	Rice 3 years, soybeans 3 years	Soybeans, 1 bushel per acre Rice, 2 to 3 bushels per acre	Rice, 50 to 65 pounds nitrogen second and third year
6	4	Soybeans 1 year, grain sorghum 1 year	Soybeans, 1 bushel per acre (rows). Grain sorghum, 8 lbs. per ac.	Grain sorghum 30 pounds nitrogen

ditches must be provided to adequately drain them. Usually the production does not warrant construction of expensive ditches except as a means of draining better nearby soils.

These soils are best adapted to pasture and forest. Fescue does well on this land. Any cultivated crop is not very well adapted because of the poor drainage and water hazard.

The soils of this group are as follows: 525, 524, 5256, 615, 615B+, 515, and 514.

Group 6a. The soils of this group are deep moderately well to well drained soils occuring on gently rolling to rolling topography (slope, 8 to 17 percent) of both the upland and old stream terraces. On the terraces these soils are located on the short abrupt slopes of the former stream banks. These soils have moderate to light surface textures. The texture is a silt loam except where severe sheet erosion has removed the silt loam surface and exposed the silty clay loam subsoil. Some areas have an occasional deep gully not crossable with heavy farm machinery (indicated by the symbol (7)).

The major problem is in controlling erosion. This may be done by keeping a vegetative cover as much of the time as possible.

The best uses of these soils are for pasture and forest production which will keep them protected from erosion with good management. These soils are well adapted to Dallis grass, Bermuda grass, lespedeza, crimson clover, sericea lespedeza and kudzu. Pasture combinations and recommendations may be found on page 23.

The soils of this group are as follows: 954D3, 954D3(7), 844D3, 844D3(7), 944D3, 944D3(7), 9546D3(7), 955E2, 955E2(7), 945E1, 945E1(7), 945E2, 945E2(7), 9556E1, 9556E2, 9458E1, 9546E3, 9546E3(7), 9448E3, 954E3 954E3(7), 844E3, 844E3(7), 944E3, 944E3(7), 955E1.

Group 6b. These soils are moderately well drained and occur on gently rolling to rolling topography in the hills and on old stream terraces. They are characterized by having a compact hardpan layer at a depth of about 20 to 30 inches. The surface is a silt loam except on the severely eroded areas where the silt loam has washed away leaving the silty clay loam subsoil exposed. Some of the areas have an occasional deep gully (indicated by the symbol (7)).

Preventing excessive erosion is the major problem on these soils. A vegetative cover should be kept on them as much of the time as possible and care should be used to prevent formation of gullies by controlling runoff water from more level areas.

These soils are best adapted to pasture and forest production. They are adapted to about the same pasture crops as for group 6a except kudzu does not do very well. Pasture recommendations may be found on page 23.

The soils of this group are as follows: 834D3, 834D3(7), 934D3, 934D3(7), 935E1 and 935E2.

Group 6c. The soils of this group are somewhat poorly drained, severely eroded soils that occur on undulating (slope 3 to 5 percent) topography of the uplands and old stream terraces. Sheet erosion has removed practically all of the original silt loam surface leaving the silty clay loam subsoil exposed. A compact hardpan layer beginning at a depth of about 12 to 20 inches is found in these soils. Some deep gullies not easily crossable with farm machinery may be found in some of the areas (indicated by the symbol (7).

Erosion control is the main problem. A permanent vegetative cover should be maintained as much of the time as possible. Control of the gullies may be had by establishing a grass sod, planting trees and constructing small check dams. The

Table 6. **Cropping system, seeding and fertilizer recommendation for a Brown Loam Farm.**

Field No.	Acres		Crops	Seeding Recommendation	Fertilizer Recommendation
1	28	(18 ac.)	Dallis grass-Lespedeza pasture in bottom (18 ac.)	15 lbs. Dallis grass per ac. 15 lbs. Common Lespedeza per ac. planted in Feb. or early March. 30 lbs. Sericea per acre planted March 1 to May 1.	500 lbs. 20% superphosphate and 200 lbs. muriate of potash every 2 years. 2 tons of lime every 4 or 5 years
		(10 ac.)	Sericea lespedeza on upland (10 ac.)		
2	25		Bermuda-Crimson Clover pasture	Bermuda established, over seed with 20 lbs. per ac. reseeding Crimson Clover on Oct. 1 to Nov. 15	500 lbs. 20% superphosphate and 150 lbs. muriate of potash every 2 years. 2 tons of lime every 4 or 5 years
3	20		Dallis grass-Lespedeza pasture	Same as in Field 1 for Dallis-Lespedeza pasture	Same as for Field 1
4	5		House site, graden, orchard, etc.		
5	8		Four yr. rotation—Oats followed by lespedeza 2 yrs. and cotton or corn 2 yrs. with winter cover crops of vetch	2½ bu. Oats, planted Sept. 15 to Oct. 15 35 lbs. Kobe lespedeza planted Feb. or Mar. (cover crop as below)	On Oats 60 lbs. nitrogen, 500 lbs. 20% superphosphate 100 lbs. of potash 60 lbs. nitrogen in Feb. (cotton as below) Corn 600 lbs. 6-8-8 side dress with 90 lbs. nitrogen
6	28		Cotton—cover crop of vetch or widl winter peas or (cotton 2yrs., corn 1 yr.)	1 bu. cotton seed (delinted), 30 lbs. vetch or 50 lbs. wild winter peas planted Sept. 1 to Oct. 15	With good cover crops, 600 lbs. 6-8-8 and 30 lbs. nitrogen without cover crop, 500-600 lbs. basic slag on cover crops
7	22	(11 ac.)	Six year rotation Fescue and white clover 3 yrs.	10 lbs. fescue, 2 lbs. white clover seeded in Sept. or early Oct. 1 bu. cotton seed (delinted) (cover crop as above)	500 lbs. 20% superphosphate 200 lbs. muriate of potash 60 lbs. nitrogen, 2 T of lime every 4 or 5 years. Maintenance: 60 lbs. nitrogen 300 lbs. superphosphate 100 lbs. muriate of potash Cotton as in field 6.
		(11 ac.)	Cotton 3 yrs. with cover crop of vetch or wild winter peas		
8	64	(32 ac.)	Six year rotation **Fescue and White clover**	Fescue and Clover as above Corn 10 to 14 lbs. Sorghum 5 to 7 lbs. planted April 20 to May 20	Fescue and Clover as above Corn 600 lbs. 6-8-8 under, side dress with 90 lbs. nitrogen. Sorghum 500 lbs. 6-8-4 or equivalent.
		(32 ac.)	Corn or 22 ac. corn and 10 ac. sorghum for silage		

top soil is not deep enough to warrant using machinery to push in the gullies. These soils are adapted to permanent pasture and forest production. They are adapted to the same general pasture crops as group 6a except for lespedeza sericea and kudzu. Much less production may be expected than on the soils of group 6a under the same level of management. Pasture recommendations may be found on page 23.

This group is made up of the following soils: 824C3, 824C3(7), 924C3, and 924C3(7).

Group 7a. The soils of this group are deep moderately well to excessively drained soils that occur on the steeper slopes of the uplands. The surface runoff is rapid to very rapid. The topography ranges from rolling to hilly with a majority of the areas being hilly with slopes that range from about 12 to 75 percent. The predominant surface texture is a silt loam although this group contains a few areas of Coastal Plain soils which have a gravelly sandy loam and loamy sand surface texture. Some of these soils have an occasional deep gully not easily crossable with farm machinery (indicated by the symbol (7)).

These soils eroded very easily on these steep slopes and they are not adapted to cultivated crops or pasture. Care should be used to stop the gullies by providing protective outlets for the water from the more level areas that flows across these soils. They are best adapted to forest and at the present time they are covered with a protective forest cover. Good management includes protection from fire and grazing, harvesting mature trees and removal of undesirable trees.

The soils of this group are as follows: 965F1, 955F1, 955F1(7), 955F2, 955F2(7), 945F2, 945F2(7), 9556F1, 9556F1(7), 9556F2, 9556F2(7), 9458F1, 9458F2, 9788E1, 9788F2(7), 9779F1, 9779F2, and 9779F2(7).

Group 7b. The soils of this group are deep moderately well to well drained soils of the more rugged and eroded uplands and terraces. One or two areas of excessively drained Coastal Plain sandy soil are included in this group. All of these soils are severely eroded and nearly all of them are cut up with frequent deep gullies that are not crossable with farm machinery (indicated by the symbol (8)). Many of the areas have had 75 percent or more of the soil area destroyed by gullies, these areas are called Rough Gullied Land, Loring soil materials and are indicated by the symbol 940. The topography of these areas ranges from undulating to hilly with a majority of the areas being gently rolling to rolling (slope, 8 to 17 percent).

Stabilizing and controlling the erosion on these soils is the major problem. Often these gullies extend into the sand and gravel of the Coastal Plain formation and the resulting erosion and deposition of these materials in the drainageways, ditches and soils of the bottoms is detrimental to crop production and workability of these productive soils.

These areas may be stabilized by establishing a permanent cover and building check or desilting dams. They are best adapted to trees which will provide a long time protective cover. Some of the less steep areas may be planted to kudzu and used for temporary controlled grazing. Some of the gullies may be filled by the use of heavy machinery and sodded with grasses or pasture mixes and used for controlled grazing although this is an expensive process.

The soils of this group are as **follows:** 954D3(8), 954E3(8), 954F3, 954F3(7), 954F3(8), 944C3(8), 944D3(8), 944E3(8), 844D3(8), 844F3(8), 944F3(7), 944F3(8), 9546D3(8), 9546E3(8), 9546F3(7), 9546F3(8), 9448E3(8), 9448F3(8), 9788F2(8), and 490 all slopes.

Group 7c. The soils of this group are moderately well drained. They have a compact hardpan layer beginning at a depth of about 20 to 30 inches. Except for one or two steep wood areas they are severely eroded and most areas have frequent deep gullies not crossable with heavy farm machinery. Some areas have had 75 percent or more of the soil area destroyed by gullies (these areas are indicated by the symbol 930). These are the more severely eroded and gullied hardpan soils. The topography ranges from undulating to hilly with the majority of the areas being gently rolling to rolling (slope 8 to 17 percent).

The major problem with these soils is to stabilize them and prevent excessive sand and gravelly materials of these deep gullies from being deposited on the better soils and in the drainage ditches below. These soils are not deep enough to warrant pushing in the gullies with heavy machinery and they are not very well adapted to kudzu. They can best be permanently stabilized by planting to trees. Temporary help may be had by building desilting basins in the more gullied areas.

The soils of this group are as follows: 834C3(8), 834D3(8), 934C3(8), 934D3-(8), 934E3, 934E3(7), 934E3(8), 934F3-(8), 935F1 and 930 all slopes.

Delta Area

Although each soil probably has individual requirements for certain good management practices, some have management requirements in common. Soils with many management requirement in common have been grouped in this section for convenience of discussion. It is recognized that certain of the management practices suggested for the various soils may not be feasible for many farmers under present conditions. Some may attain the same objective by the use of combinations of management practices different from those indicated and better suited to their particular conditions.

Group D1a. All the soils of this group are very fertile, the most productive soils for nearly all of the crops commonly grown in the county. They are fairly well to well drained soils with light textured (silty or sandy) surface layers and subsoils through which water is not restricted very much in its movement. Plant roots, water and air penetrate these subsoils rather easily. Water storage capacity is high except on the very sandy soils (466A1, 466B1, and 467B1) which may tend to be droughty during prolonged dry periods. These soils are easy to till and may be plowed over a wide range of moisture conditions but rains causes them to crust when bare. They occur on nearly level to gently undulating topography (slopes 1/4 to 5 percent).

Since the subsoils of these soils are somewhat open or porous little artificial drainage is needed. On the more level areas a system of W-type ditches will furnish sufficient surface drainage. The rows should be run on the contour and water from them should not run off on the more poorly drained areas.

These soils are well adapted to all general crops grown in the area except rice. High yields may be maintained over a long period of time under good management. They may be cropped annually followed by winter legumes. Where winter legumes are turned under an additional amount of commercial nitrogen must be added to maintain high yields. If alfalfa or clover is to be grown, a soil analysis should be made by the soils laboratory to determine the need for minerals and fertilize accordingly. Due to their sandy nature, good internal drainage and high elevation, these soils are well suited to winter grazing. The soils of this group are as follows: 156A1, 156B1, 136A1, 136B1, 135A1, 135B1, 466A1, 466B1, 467B1, 456A1, 456B1, 446B1, 445A1, 445B1, 436A1, 436B1, 436B2, 435A1, 435B2, and 235A+.

Group D1b. These soils are similar to group D1a differing primarily in degree of slope. They occur on undulating (slope 6 to 10 percent) topography and are more subject to erosion than group D1a soils. They are fertile fairly well to well drained soils with light textured (silty or sandy) surfaces and subsoils. Water, plant roots and air penetrate these subsoils rather easily. Due to the steeper slopes water storage capacity is not quite as high as on the more level areas and crops tend to suffer more during prolonged periods of drought. These soils are easy to work and may be plowed over a wide range of moisture conditions. A crust is formed over these soils after a rain when they are left bare.

Some of these soils are moderately eroded and care must be used to prevent more erosion. Rows should be run on the contour. Row crops should be rotated with close growing crops for pasture, hay or soil improvement.

These soils are adapted to all general crops of the area except rice. They are especially well suited to pasture and hay production. Good results may be had from growing Dallis grass, lespedeza, crimson clover, Sudan grass, millet and winter grazing crops on these soils. Rotations of one year of row crops to two of close growing crops are suggested. Organic matter may be added, fertility and physical properties improved by turning under winter and summer legumes as well as residues of other crops. Additional nitrogen from a commercial source should be added for highest yields, after growing winter legumes. A soil analysis should be made by the soils testing laboratory to determine the need for other minerals before planting alfalfa or clover.

The soils of this group are as follows: 135C1, 466C2, 467C2, 456C2, 446C2, 445C1, 445C2, 436C2, and 435C2.

Group D2a. These soils have fairly heavy surface textures and water moves through the subsoil fairly well. The topography ranges from nearly level to gently undulating (slope 1/4 to 5 percent). More artificial drainage is required than on group D1a; this may be provided by a system of V- and W-ditches. Due to heavier surface texture, the moisture range for easy tillage is not quite as wide as for the sandier textured soils.

These soils are excellent for grass and hay, very good for cotton and corn and are well suited to sericea, alfalfa and other deep rooted perennials. Soybeans, lespedeza and small grains are also well adapted. The soils are suited to winter grazing.

Rows should usually be run on the contour. Commercial nitrogen is needed for best yields on non-legumes. For alfalfa and clovers, a soil test should be made to determine the need for other minerals.

The soils of this group are: 134A1, 134B1, 133A1, 133B1, 434A1, 434B1, 433A1, 433B1, 333A1, and 333B1.

Group D2b. These soils are very similar to the soils of group D2a differing primarily in being located on steeper slopes. They occur on undulating topography (slope 6 to 10 percent), are fairly well drained internally, and have a fairly heavy textured surface. Erosion is a problem on these soils and some of them are moderately eroded.

Surface drainage is moderately rapid and control measures must be used to prevent erosion and conserve moisture. These measures include contour rows and rotation with sod or close growing crops. Suggested rotations involve one year of row crops to two years of sod or close growing crops. These soils are adapted to the same general crops as those of group D2a and are especially well adapted to deep rooted perennials such as sericea and alfalfa. They are very good for permanent pasture crops and for winter grazing. Winter legume crops may be grown but non-legume crops will need additional commercial nitrogen for best yields.

The following soils are in this group: 434C1, 434C2, and 433C2.

Group D3. The soils of this group have medium to fairly heavy textured surface layers and have rather poor internal drainage due to the high silt and clay content of this subsoil. They occur on nearly level to gently undulating topography (slope 1/4 to 5 percent) and are usually found in relatively broad areas. The common local name for this group of soils is "post oak" land.

The movement of water down through this soil is retarded by the heavy textured subsoil and the increased surface water runoff must be taken care of by extensive artificial drainage ditches. A system of V- and W-type ditches through the low areas of the fields connecting with other or similar ditches in the associated depressions should provide sufficient surface drainage. Row direction should be such that excess water is carried to adequate outlets.

These soils are fairly well adapted to cotton and corn and are excellent for pasture and hay. Rice is well adapted to the more level areas. They are well suited to small grain, soybeans and lespedeza. When used for row crops it is suggested that a rotation with close growing crops for pasture, hay or soil improvement be used every other year and that winter legumes be grown where practical.

The soils of this group are as follows: 124B1, 425A1, 424A1, 424B1, 326+B, 325+A, 325+B, 324A1, 324B1, 314A1, and 210A+.

Group D4a. This group of soils was formed from heavy textured sediments. The high clay content of the subsoil permits very little downward movement of water. These soils occur on nearly level to gently undulating topography (slope 1/4 to 5 percent) with the majority of the area being nearly level. They are found on the lower elevations in the Delta.

The lack of internal downward movement of water makes an extensive drainage system necessary to provide for the greater runoff from these soils. Rows should be run so as to give the best possible drainage, provided this does not induce erosion, and a system of V- and W-ditches should carry excess water to the main or primary ditches.

The heavy textured surface on these soils makes land preparation difficult. They are hard when dry and plastic or sticky when wet. Best results are usually obtained when these soils are bedded in the fall. The growing of winter legumes is very hazardous because of the excess water in the winter and also because this will require the land to be plowed in the spring.

These soils are well adapted to rice, hay crops, grasses and soybeans but are only fair for cotton and poor for corn. When used for cotton, a rotation which includes a summer legume or sod crop two years out of four helps maintain the fertility level and improves the physical condition of these soils. Due to low elevations and plastic or sticky characteristics they are not very well adapted to winter grazing except on a heavy sod crop. Alfalfa does well when excellent surface drainage is provided.

The soils of this group are as follows: 123A1, 423A1, 323A1, 322A1, 322B1, 313A1, 313B1, 312A1, and 312B1.

Group D4b. The soils of this group are very similar to those of group D4a, differing primarily in being located on more level topography (slope, 0 to 1/4 percent). They occupy the low level area and water removal is a major problem. Water sometimes stands on these soils for rather long periods especially during the wet winter seasons. The heavy textured subsoils prevent or seriously retard the downward movement of water through the profile. The high clay content of the surface soil causes it to be hard when dry and plastic when wet, thus the moisture range for good tillage is not very wide.

An adequate drainage system must be provided before these soils can be utilized properly. The rows should be run so as to give the best possible drainage. Best land preparation is usually had by plowing these soils in the fall.

These soils are well adapted to rice, soybeans and grasses but are not very well suited to cotton and corn. Winter grazing and winter cover crops are not very practical.

The following soils are in this group: 322A°, 313A°, 123A°, 212A+ and 213A+.

Group D5. These soils are composed of a variety of materials but sandy textures predominated. Their sandy subsoils permits a rather rapid downward movement of water and crops tend to suffer for water during dry periods. They occur on nearly level, gently undulating and sloping topography. The steeper areas are the former banks or escarpments of the river.

These soils are adapted to early truck crops, early maturing corn, small grain and winter crops. The steeper slopes are best adapted to sod crops and hay. Rows on these areas should be run on the contour and should be rotated with close growing crops two years out of three to improve the fertility and maintain organic matter of the soil. Nitrogen fertilizers should be applied in split applications (before planting and side or top dressed) because of the tendency to leach out of these sandy soils.

The soils of this group are as follows: 460D2, 170A1, and 170B1.

In addition to the above named groups of soils of the Delta, there is an unclassified wooded area between the levee and the river. A detailed map of this area would be too difficult to be practical. Very little of it would be adapted to crops because of the floodwater hazard. Hardwood trees grow rapidly in this area and with proper management should produce a good yield of timber. Good forestry management includes eliminating undesirable trees, harvesting of mature trees, protection from fires, and providing for the reproduction of desirable species. This area has the symbol 100.

There are approximately 600 acres of land cultivated between the artificial levee and the river. The soils of this area are subject to overflow and are usually flooded at least once a year. Sometimes this overflow damages the crops and this hazard must be taken into consideration when planning to cultivate these soils. The symbol "f" within a soil mapping unit boundary of this area indicates that the soil is subject to overflow.

Preparing a Farm Plan From the Soil Map

Any man who has farmed the same land for many years knows many things about the soils of his farm. Some things about his farm he may not understand. It is important that he know about the good and bad features of his soils.

A soil map is the farmers' inventory of his land in terms of soils, their characteristics and capabilities. The soil map can be used for locating drainage ditches, farm ponds, waterways, field roads, and tenant houses; laying out permanent field and pasture boundaries; and determining row direction.

The following part of the bulletin is written for the farmer who is interested in studying the soil map and formulating and developing a logical and profitable farm plan for his farm.

To illustrate the use of soil maps in

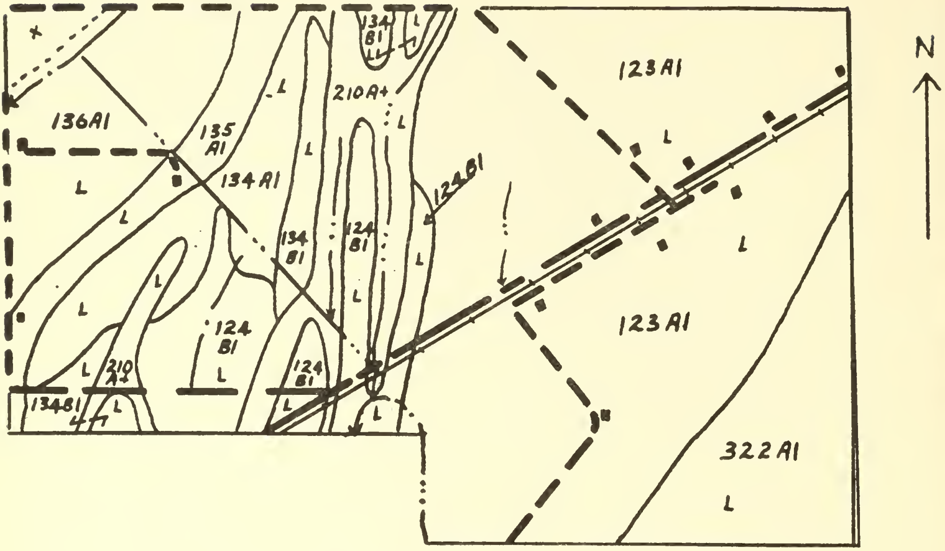
N
x
136A1
135 A1
134A1
134 B1
210A+
124 B1
124B1
123A1
123A1
322A1
124 B1
124 B1
210 A+
134B1
L

Figure 2. Soil map of a 360 acre Delta farm.

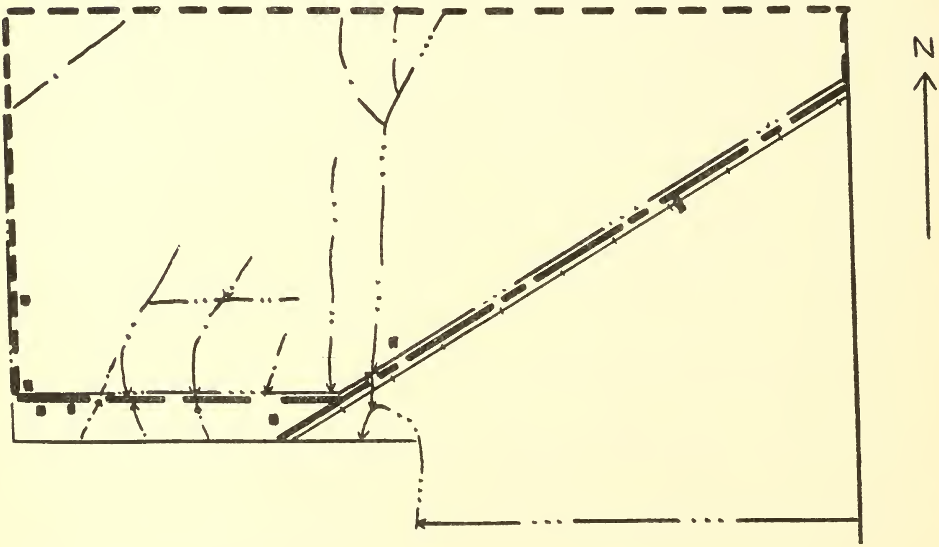

Figure 3. Delta farm drainage map with road and house locations.

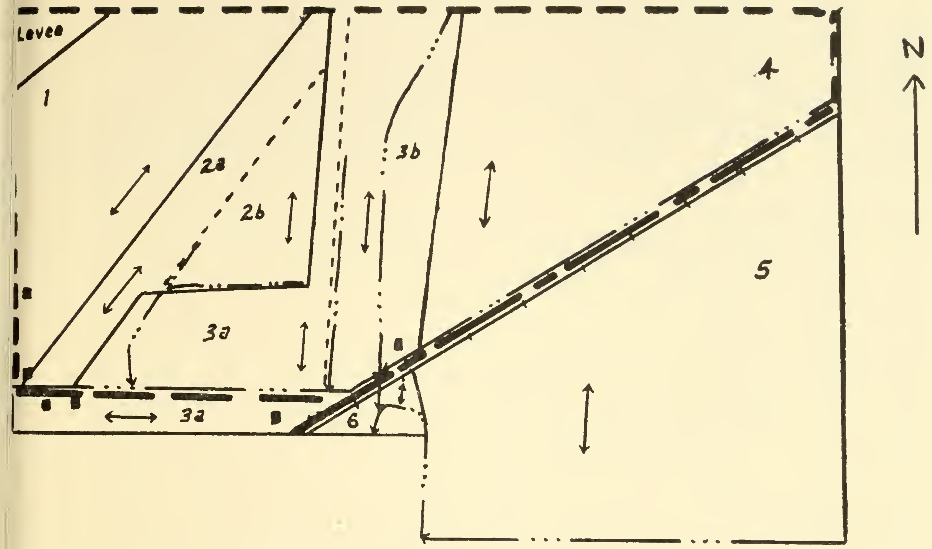

Figure 4. Field layout map of Delta farm with row direction indicated.

arm planning a 360-acre Delta farm and a 200-acre Brown Loam farm have been selected.

The soil map of the Delta farm (figure 2) indicates that there is quite a range in the soils and that a variety of crops should be grown so as to use the soils for the best adapted crop. The soils in the northwest corner are moderately well drained and have a light texture. These soils gradually get heavier and less well drained until the poorly drained clay soil is reached in the southeast corner. The soil map also indicates that the soils are all sweet except the 322A1 in the southeast corner which is usually sweet or only very slightly sour, therefore, no lime should be required on this farm at least for a number of years on general crops.

In selecting a type of farming operation the soils as well as the likes and dislikes of the farmer must be considered. This farm has been used primarily for cotton in the past. It is thought that a diversified cotton, soybeans, small grain type of program could be used to an advantage.

The drainage system for this area is very important and should not be too difficult on this farm. The low depression areas (210A+) form the natural drainage pattern. Road side ditches along the north side of the main gravel road and the lower east-west road and along the north-south field road should be provided to empty into the main drainage bayou in the south center of the farm. One dragline ditch runs south through the center of the farm, another should be constructed on the south boundary to drain into the main drainage ditch to the west. Other smaller ditches should be provided in the center of the low depressional areas.

The shallow ditch beginning near the northwest corner should be eliminated so as to provide longer rows and greater efficiency for machinery operation. A short small cross ditch constructed in the west part of the farm should keep the water from flowing onto a poorer drained soil. This ditch can also be used as a field boundary. This series of ditches together with proper row direction should provide ample surface drainage for this farm. If row crops are to be grown most of the time on the heavier soils on the eastern side of the farm then an extensive W-ditch system should be constructed so as to empty into the main ditches to the south. Since it is planned to use this area for rice the W-ditches will not be needed.

Figure 3 shows the proposed drainage, field road and house locations for this farm. Property boundaries, soil boundaries, bayou banks and stream banks make excellent location for roads. Roads that divide fields of the same soil type should be eliminated to provide longer rows and larger fields. Many of the empty tenant houses may be eliminated since the labor requirements for proposed cropping system will not be as great as for the usual cotton farming. It is best to group the tenant houses on or near the main roads so that labor can be easily contacted, and electricity, natural gas or water can more conviently be brought to one general area.

The soil map can be used to group soils that have similar characteristics and require similar treatments into one field. Figure 4 shows the proposed permanent field layout and row direction on this farm. The soils of field 1 are well adapted to cotton and this crop may be grown continuously provided winter legumes are grown each year. The heavier texture of the soils of field 2 require the addition of more organic matter to keep them in a good state of tilth. This may be done by growing soybeans two years followed by two years of cotton. Fields 3 and 6 are made up primarily of somewhat poorly to poorly drained soils that are not too well adapted to cotton. These fields may be used for a soybean grain sorghum rotation, alternating each year. Fields 4 and 5 are composed of soils that are not very well adapted to cotton. These level fields are well adapted to soybeans or rice production and the acreage involved (195 acres) is of sufficient size to warrant the expense involved in growing rice. Soybeans may be grown the first year and rice for three years and then back to soybeans for another three years on these fields. Table 5 shows the acreage of each field, suggested cropping system and seeding and fertilizer recommendations

It may not be practical for the farme to make all of the suggested changes in one year, but the plan can be used as a guide or goal to be reached as conditions permit.

The soil map of the Brown Loam farm (figure 5) indicates that this farmer has a variety of soils which includes upland terrace, local alluvium and bottom soils The soils of the uplands are 944B3 944C3(7), 934B3, 934C3, 934D3(7), and 934D3(8). They are moderately well to well drained (as indicated by the middle figures 3 and 4), severely eroded and some of the areas have gullies. These soils are well adapted to pasture crops provided some special work is done on the gullied areas. The soils of the terrace are 835B2 and 834B3. These soils occupy a somewhat lower elevation and are not as sloping as most of the upland soils. They are moderately well drained (as indicated by the middle figure 3). The 835B2 unit shows some erosion but it still has about four or five inches of the original silt loam surface. Severe sheet erosion has removed the original surface of the 834B3 unit leaving the heavier textured subsoil on the surface (as indicated by the third figure 4). These soils are well adapted to pasture crops or rotations which include row crops. There is only one area of local alluvium soils (635B+) found in the southwest portion of the farm on the toe slopes and along the small drainageways. This soil is somewhat poorly to moderately well drained and has a silt loam surface. This area may be used for row crops or pasture depending upon the use of the adjacent soils. The soils of the bottom include the somewhat poor to moderately

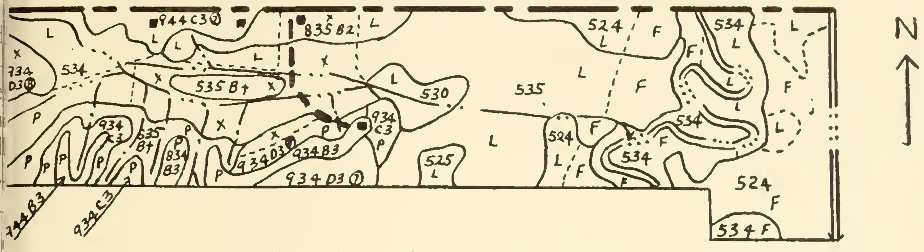

Figure 5. Soil map of a 200 acre Brown Loam farm.

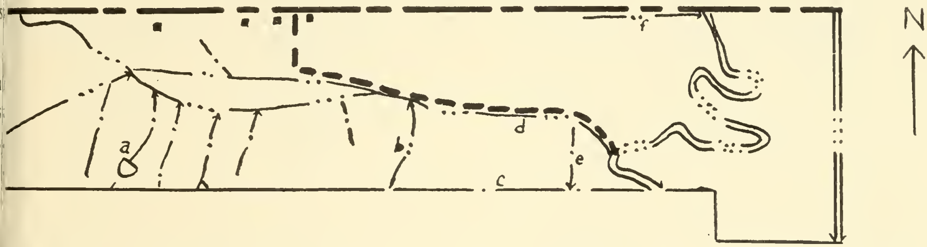

Figure 6. Brown Loam farm drainage map with road and house locations. A new pond is shown at a and new ditches at b, c, d, e, and f.

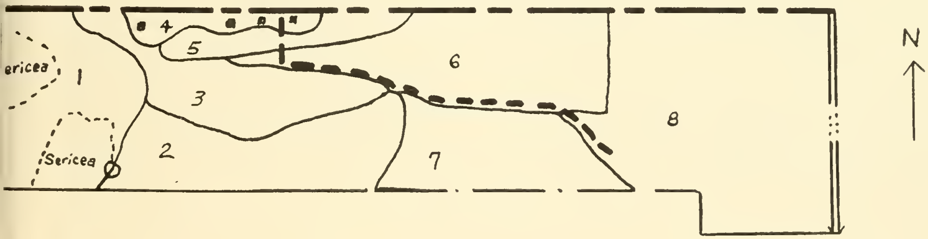

Figure 7. Field layout map of Brown Loam farm showing permanent field and pasture boundaries.

well drained 535, 535B+, 534 and 530 which are well suited to row crops or pasture; and the somewhat poorly drained 525 and 524 which are best suited to pasture or pasture-row crop rotation. The third figure indicates that these soils have silt loam (5), silty clay loam (4) and mixed silt and sand textures (0).

With this wide range of soils it is thought that best use could be made of these soils by use of a combination dairy and cotton farm. There are ample soils well adapted to pasture, others well adapted for the production of feed and some well adapted for the production of cotton.

Some consideration must be given to the farm layout. Figure 6 shows the proposed changes in the drainage system and the location of field roads and houses. A small farm pond (a) should be constructed in one of the small drainageways to provide water for the cattle in two pastures. A diversion ditch (b) should be constructed to help keep overflow water off the bottom. A half W-ditch (c) will provide ample drainage along part of the south boundary. A dragline ditch (d) needs to be constructed along the channel of an existing small ditch. A W-ditch (e) will drain a wet area and a small ditch (f) along the roadside will provide drainage for a poorly drained area. A more convenient location for the tenant home in the field may be found on the main road near another tenant house. Along the banks of the dragline ditch is a good location for a field road.

Figure 7 gives the permanent field and pasture layout for this farm. Each field is numbered for easy reference to the proposed land use. The upland portion of field 1 is to be planted to sericea for hay or grazing while the bottom soils are to be planted to Dallis grass and lespedeza for pasture. Field 2 is composed primarily of upland and terrace soils which have a fairly good cover of Bermuda grass for which they are well adapted. Reseeding crimson clover is recommended for overseeding on the Bermuda grass. Field 3 is composed of soils of the bottoms that are well adapted to row crops or pasture. Because of its location a Dallis grass-lespedeza pasture is suggested for this field. Field 4 is used for houses, gardens, orchards, etc. The soils of field 5 are best adapted to permanent pasture or a rotation of close growing crops with row crops. A four-year rotation of oats followed by lespedeza for two years then two years of cotton or corn is suggested for this field. The soils of field 6 are well adapted to row crops and they may be grown continuously provided a winter legume crop is turned under each spring. Cotton continuously or two years cotton and one year of corn is suggested for this field. The soils of field 7 are fairly well adapted to crops and are well adapted to pasture. A six-year rotation including three years of fescue and white clover and three years of cotton is planned for this field. Field 8 is composed primarily of somewhat poorly drained soils that are well adapted to pasture and are fairly well adapted to corn and sorghum. A six-year rotation including three years of fescue and white clover and three years of corn or sorghum for silage is recommended for this field. It is also recommended that the wooded areas in field 7 and 8 be cleared and the soils utilized for the more profitable production of pasture and row crops. Table 6 outlines the cropping system, seeding and fertilizer recommendations for this farm. This plan should furnish ample pasture and feed for approximately 45 dairy cows and have 28 to 47 acres left for the production of cotton.

Soil series of De Soto County.

DELTA AREA			
First Bottom	**Low Terrace**	**Low Bottom**	**Depression**
Crevasse	Beulah	Tunica	Souva
Robinsonville	Bosket	Sharkey	Dowling
Commerce	Dubbs	Alligator	
Mhoon	Dundee		
	Forestdale		
BROWN LOAM AREA			
Deep Loess			
Upland	**Terrace**	**Local Alluvium (Colluvial)**	**Bottom**
Natchez	Lintonia	Tigrett	Vicksburg
Loring	Richland	Briensburg	Collins
Grenada	Olivier	Dyer	Falaya
Calloway	Calhoun		Waverly
Henry			
Mixed Brown Loam and Coastal Plain			
Lexington			Hymon
Brandon			Ina
Providence			
COASTAL PLAIN			
Guin			
Kershaw			

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5356	1a	33
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324A1	D3	44
324B1	D3	44
325+A	D3	44
325+B	D3	44
326+B	D3	44
333A1	D2a	43
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423A1	D4a	44
424A1	D3	44
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M696
no.512

BULLETIN 512 MARCH, 1954

THE HOME-PRODUCED FOOD SUPPLY OF NON-OWNER FARM FAMILIES

SOME FACTORS ASSOCIATED WITH IT

By
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SUMMARY

The purpose of this study was to investigate factors associated with money value of the home-produced food supply of non-owner farm families in cotton areas of Mississippi.

Four hundred and forty-three white and Negro families in Quitman and Tate counties, Mississippi, were interviewed with the use of a schedule during May and June, 1952. Only families of two or more members and families in existence one year or more were included. During the year preceding the study (1951-1952) these families had an average income of $1389. The incomes of 70 percent of them ranged from $500-$1999.

For purposes of the study, families were classified into two groups according to money value of home-produced food used per person per family during the year preceding the interview. These groups were (1) under $75 per person per family, including 249 families (2) $75 and over per person per family including 194 families.

Cash expenditures for food (including that eaten at home and away from home) during the year preceding the interview averaged about $500 for both groups of families. From estimates of purchases of certain key foods made by the homemakers, it would seem that lower production of families in group (1) was not made up by purchase.

The two types of factors which it was thought might be associated with money value of home-produced food used examined were (1) general family characteristics (2) other factors including those more directly related to specified practices and to habits and attitudes of individual family members.

Included in family characteristics were net family income, form of farm non-ownership (whether renter or sharecropper and farm laborer) race, schooling of male head and wife, and size of family. Lower money values of home-produced food were found to be associated with lower family incomes, farming as a sharecropper or farm laborer, the Negro race, less than 7 grades schooling of male head, less than 7 grades schooling of wife, and families with 6 members or more.

Other factors examined included: (1) present practices and knowledge of recommended practices (2) facilities for food production (3) losses through food spoilage (4) time expenditures of wife and male head (5) production traditions, attitudes, and planning (6) participation in agricultural and home economics groups; reading (7) who does the production and processing tasks.

(1) Present Practices and Knowledge of Recommended Practices

Relatively more families in the higher ($75 and over per person) group carried on various food production and processing practices. A larger percentage of families in this higher production group had served one or more foods on the report day in 5 of the 7 basic food types. Families with hens, hogs, and a garden in this higher production group were using better feeding practices, more often doing something about poultry diseases and garden pests.

The knowledge, which homemakers in these two groups of families had about food types they should have in a day's menus, about egg and milk production standards, about how to feed hens and hogs, and about treatment for poultry diseases and garden pests, was not significantly different.

(2) Facilities for Food Production

Families in the higher food production group much more often had production facilities such as pasture land, land suitable for a garden, and fenced land for hogs. But there was no difference in percentage of families having these facilities in the two groups who took advantage of them by having a cow, a garden, and hogs.

(3) Food Losses Through Spoilage

Spoilage of food was not a special problem for either of these non-owner groups. It was somewhat more a problem for the higher money value group who had more food to process or store.

(4) Time Expenditures of Wife and Male Head

Wives and male heads in the higher food production group had spent more time in food production and processing for family use during the week for which a record of all work activities was given, than had those in the lower food production group. In both groups it was more often the wife who carried on such production and processing activities and spent most time in doing them. More families in the lower food group had babies and young children. But wives in these families did not average as much time in household activities, including care of children, as did wives in the higher food group. They did spend on an average more time in gainful work (usually work on the farm crop) than did wives in the higher food group.

(5) Production Tradition, Attitudes, and Planning

Sixty-three percent of the homemakers in the lower value group and 84 percent in the higher value group had learned to milk when children. Almost two-thirds of the women in each group of families had learned to can when children (29 percent of the homemakers in the lower group and 9 percent in the higher group had never milked; the proportions for those who had never canned were 5 and 2, respectively.)

There was no evidence in this study that limited food production for home use was related to not liking home-produced foods.

When asked food production and processing tasks their husbands liked best, women in the higher food production group mentioned much more often work with livestock than women in the lower food production group. Women in the lower food production group answered, "Likes no home-production task" more often than women in the higher food production group.

When homemakers of the study were asked if they would have more, the same, or less home-produced food this year than last year, 52 percent in the lower group and 69 percent in the higher group replied "More this year." When asked to give the reason, only 6 percent of those in the lower and 9 percent in the higher group mentioned planning. But about one-half of the women in both groups reported practical phases of planning such as planted more, have more hogs and hens, have a new cow.

(6) Participation of Family Members 10 Years and Over in Agricultural and Home Economics Groups; Reading

Relatively more wives or female heads and daughters in families of the higher production group were participating at the time of the study in one or more home economics programs than were wives or female heads and daughters in families of the lower production group. There were no differences in present participation in agricultural programs by men and boys in families of the two groups.

When wives or female heads, sons and daughters are classified by whether they have participated or are now participating in a Home Demonstration Club or a 4-H Club program, a significantly higher percentage who had participated or were participating were members of families in the higher production group.

More families in the higher production group were subscribing to one or more homemaking and agricultural magazines and papers than families in the lower production group.

(7) Who Does Production and Processing Tasks

There was no difference in the average number of members doing the 18 specified tasks in families of the two groups performing such tasks. But there was a difference in the two groups in which family members performed these tasks. The higher production group of families had relatively more male heads working on these 18 specified production and processing tasks, relatively fewer children; while the lower production group of families had relatively fewer male heads and relatively more children.

The job of buying groceries was more often shared with the wife in the families having higher food production.

The Home-Produced Food Supply of Non-Owner Farm Families

SOME FACTORS ASSOCIATED WITH IT

By DOROTHY DICKINS[1]

INTRODUCTION

Previous dietary studies have shown that farm families with limited food production and conservation programs do not make up inadequacies of food supply by purchase. These studies show that production and conservation of food for home use is especially limited in cotton areas of the South. This is particularly the case with non-owner farm families, including tenants and laborers, in such areas.[2]

In Mississippi the predominant type of farming is cotton farming. More of those who work as farmers are non-owners (either tenants or laborers) than are owners. For this reason the home-produced food supply has special significance for farm people of the state and for those doing educational work with them. Since adequacy in diet is so closely correlated with the home-produced supply—this supply might be considered as the basis on which programs for better health must be based. It is the purpose of this particular report to point out some of the factors associated with lower and higher money values per person of home-produced food, by non-owner farm families in cotton areas of the state. In the group of higher values per person families are suggestions for improving the supplies of lower production families.

THE FAMILIES

The study was made in Quitman County of the Delta area and in Tate County of the Brown Loam area. In both counties the cotton farm was the predominant type of farm. In both of these counties there was a large number of non-owner white and Negro farm families.

Sample areas were drawn by statisticians in the United States Bureau of Agricultural Economics to yield approximately 100 white and 100 Negro non-owner farm families in each of these counties. Data were obtained in May and June, 1952 by personal interviews with the homemaker and other members of the family. Data were obtained from a total of 443 families. The families were distributed in the two counties and according to race as follows:

	Quitman County	Tate County
White families (no.)	99	113
Negro families (no.)	104	127

Only families of two or more members and families in existence one year or more were included in this study. Those families in which most of the land they farmed was not owned were in this study regarded as non-owners.

The net incomes of 81 percent of the 443 families in this study during the report year May 1951-May 1952 were below $2000. Net incomes included sum of receipts from farm operation minus farm expense; wages and salaries; non-farm business receipts minus business expenses; and all other non-farm income except non-recurrent income such as inheritances. Five percent of the families had incomes of $3000-$4999 and one percent had incomes of $5000 and over. Distribution by income groups was as follows:

Net Income Groups*	Percentage
Under $500	11
$500 - $999	35
$1000 - $1999	35
$2000 and over	19

*Seven families did not give the necessary income information. These families were placed in an income group on basis of information which was available.

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[1] Thanks are due W. J. Drapala for suggestions and help in connection with statistical analyses.

[2] **Family Food Consumption in Three Types of Farming Areas of the South, I, An Analysis of 1947 Food Data**, Southern Cooperative Series Bulletin 7, June, 1950, and **II, Analysis of Weekly Food Records, Late Winter and Early Spring**, 1948, Southern Cooperative Series Bulletin 20, November, 1951.

The families in this study had an average net income of $1389. Of this amount an average of $1033 was netted from farm operation, $252 from wages, salaries, and non-farm business and $104 from other non-farm income, such as old age pensions, government allowances based on military services. Most of the $252 from wages, salaries and non-farm business was from farm wage work. The amount of net income from non-farm work was very small. An average net decrease of $28 in value of crops stored and of livestock owned between the beginning and end of the report year was sustained. If this is taken into consideration the amount netted from farm operation would average $1005 rather than $1033.

MONEY VALUE HOME PRODUCED FOOD

In this study all foods produced by the family or secured from lakes, woods, fields, and the like and used by the family (during the year preceding the interview, May 1951-May 1952) were regarded as home-produced. Data were obtained on the amounts of such foods used during this report period.[3] This record included both home-produced, fresh and processed food.

Home-produced foods eaten by the household were valued at the price the farmer could have received for them if he had sold them. Prices compiled by the Bureau of Agricultural Economics of the United States Department of Agriculture for Mississippi were used in so far as possible. Where such prices were not available and the food was sold locally, typical prices received by local farmers were used.

Families in this study have been classified into two groups for analysis —those using during the report year less than $75 per person per family of home-produced food and those using $75 or more per person per family of home-produced food. The first group we will designate as the lower money value group and the second group as the higher money value group. As will be noted in Table 1, there are 249 families in the lower, 194 families in the higher group.

The big difference in the lower and higher money value groups were in amounts of animal food products and most especially in amounts of dairy products produced and used. The higher value group produced and used five times more dairy products than the lower value group. Families with the lower value averaged 5.11 members and those with higher values, 4.32 members.

The higher money value groups were higher not only because they ate more fresh home-produced food, but also because they ate more processed home-produced food. Thus, 31 percent in the lower and 64 percent in the higher group ate canned or brined home produced vegetables or fruits of one or more kinds during the report year. The

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[3] Schedule and methods used in the Southern Family Food Consumption study for obtaining annual home-produced food and income data were used in this study. A new technique was developed, however, for facilitating obtaining annual data on fresh vegetable consumption based on length of harvest per vegetable from one planting furnished by W. S. Anderson of the Horticulture Department of Mississippi State College.

Table 1. Average money value of home-produced foods used by families with home-produced values of food of under $75 per person and with home-produced values of food of $75 and over per person, 1951-1952.

Home-produced foods	Money value of home-produced foods	
	Under $75 per person (249 families)	$75 or more per person (194 families)
	Dollars	Dollars
Meat*	30	94
Poultry and eggs	28	71
Game and fish	2	2
Dairy products	43	213
Potatoes	7	17
Other vegetables	30	66
Cornmeal, syrup, and nuts	4	8
Fruits	3	10
Total	147	481

*Includes lard rendered from dressed pork.

average number of quarts eaten by those families using for the lower group, 45; for the higher group, 80. Twenty percent in the lower group and 43 percent in the higher group had home-produced canned tomatoes. Consumption of home-produced dried and frozen food was seldom reported, dried peas being the most common. Six percent of the families in the under $75 group and 21 percent in the $75 or more group reported jams, jellies, and preserves from home-produced fruits (fruits usually obtained from nearby fields or woods.)

Shown below is the distribution of the two money value groups (under $75 per person and $75 and over per person) by money value of home-produced food used per family:

Money value food used per family	Money value home-produced food: Under $75 per person per family	Money value home-produced food: $75 and over per person per family
	Percent	Percent
0	2	0
Under $100	44	0
$100 - $249	34	8
$250 - $499	16	50
$500 - $749	2	25
$750 - $999	2	11
$1000 and over	0	6

As will be noted, 80 percent of the families in the lower group had money values of home-produced food of less than $250. The proportion for the higher group having such low money values of home-produced food used was only eight. Seventy-five percent of the families in the $75 and over group (the higher group) had values between $250-$749. The highest value had by a family in this study was $1929.

HOME-PRODUCED AND OTHER FOOD

Families in the study were asked to make an estimate of expenditures for food during the year preceding the interview. This estimate included expenditures for: (1) food eaten at home, either used at meals or between meals or carried from home in packed lunches by family members (2) foods eaten away from home, not from the home supply, such as drinks, ice cream, candy, restaurant meals, boarding out. Three families in each of the two money value groups had boarded during part of the report year. Food expenditures averaged for the lower home-production group $496 (or 44 percent of net income) and for the higher one, $518 (or 30 percent of net income). Families in the lower production group spent 7 percent of the total amount spent for food for that away from home, while the higher production group spent 12 percent of their total food expenditures in this manner.

Money value of foods received as gifts averaged only about $3 per family in the lower and $1 per family in the higher groups. Milk, fresh pork, and turnip greens were the foods most frequently received as gifts.

How much cash is spent for food over a period of time is needed information, and useful in family planning. Even more important, however, is information on what is bought with the money, for kind of food purchased is related to adequacy of diet. Families in this study were asked about purchases of milk and eggs during the report year and about purchases of specified kinds of animal protein foods, of vegetables, and of fruits during the past month.

Seventy-three percent of the 249 families in the lower home-produced money value group and eight percent in the higher money value group did not own or have use of a milk cow. There were periods during the year, of course, for many families with milk cows in which the cow or cows were dry. Furthermore, some families with their own milk supply purchase certain milk products for specified uses. Listed below are percentages of families in the two groups having expenditures for specified kinds of milk. To the right of these percentages is given average quantities purchased by those purchasing during the 1951-1952 period.

Product	Money value home-produced food: Under $75 per person per family	Money value home-produced food: $75 and over per person per family
Whole Milk	15 (40 gallons)	13 (30 gallons)
Buttermilk	17 (65 gallons)	12 (26 gallons)
Canned Milk	66 (86 pounds)	36 (36 pounds)
Dried Milk	31 (33 pounds)	19 (10 pounds)

Fluid milk was purchased by a limited number of these farm families. Those families purchasing milk were most likely to purchase canned milk. Canned milk was used extensively in infant feeding. Furthermore, it is the most familiar kind of "store milk." Only recently since refrigeration has become relatively common has handling of fluid milk become feasible for rural groceries. Dried milk is also a relatively new product on the market.

Twenty-six percent of the families in the lower money value group and 9 percent in the higher money value group had buttermilk given to them during the report year. Only 8 percent of the families in the lower group had whole milk given them, while only one of the 194 families in the higher group received this kind of milk as a gift.

From estimates based on total milk produced and used, bought and received as a gift as compared with amounts suggested by the Human Nutrition and Home Economics Services of the United States Department of Agriculture (3½ cups of milk, cheese, ice cream for children and 2½ to 3 cups for adults per day in terms of fluid milk), it would seem that lack or limited milk production for home use was not made up by purchase and gift.

Seventy-three percent of the families in the lower group and 97 percent in the higher group owned hens. Homemakers in 33 percent of the lower money value group of families and 12 percent in the higher money value group of families, however, had purchased eggs during the schedule year. Average amount purchased by families buying was 18 and 16 dozen eggs, respectively.

Canned fish and lunch meat, including wieners and sausage, was the kind of meat which was purchased the month preceding the interview by the largest proportion of families in both groups. The percentage of families in the two groups having expenditures for specified kinds of meats is shown below. To the right of these percentages is given average quantities bought by those buying.

	Money value home-produced food	
Kind of meat	Under $75 per person per family	$75 and over per person per family
Lunch meat (including wieners and sausage)	68 (4.7 lbs.)	62 (4.3 lbs.)
Canned fish	67 (5.8 lbs.)	52 (5.9 lbs.)
Lean pork	40 (3.9 lbs.)	23 (5.4 lbs.)
Fresh fish	26 (7.0 lbs.)	25 (9.7 lbs.)
Beef	18 (3.7 lbs.)	25 (4.0 lbs.)
Poultry	15 (4.1 lbs.)	10 (5.0 lbs.)
Frozen fish	3 (4.9 lbs.)	5 (9.0 lbs.)

It is interesting to note that although the group of families with higher food production money values used much more home-produced meat, they used nearly as much purchased meat as did the group of families with lower values of home-produced meat. One might conclude from this production and purchase information that there were families, especially in the lower production group, who did not supplement this home supply of meat with enough meat to give 5 or 6 servings per person per week suggested for low cost diets by the Human Nutrition and Home Economics Services of the United States Department of Agriculture.

The month preceding the interview was for most families mid-spring, for a few, later spring. During this season vegetables such as turnip greens and mustard greens are commonly harvested (90 percent of the families in the lower and 98 percent in the higher money value food groups had a garden.) It is not until later spring that local cabbage is available. Irish potatoes come later, usually in June.

Those with a home processed or stored supply of tomatoes and potatoes have usually eaten it up by mid-spring. This includes sweet potatoes, too, which are harvested in the fall. In this season fresh citrus fruit is not available in as large quantities and costs more than in fall and winter. These facts are important in understanding the variations in percentage of families purchasing and in average amounts purchased of such vegetables and fruits by farm families purchasing. The percentages and averages amounts are:

Products	Money value home-produced food: Under $75 per person per family	Money value home-produced food: $75 and over per person per family
Irish potatoes	60 (16.9 lbs.)	61 (16.0 lbs.)
Sweet potatoes	6 (4.9 lbs.)	7 (4.6 lbs.)
Greens in bunches, such as turnip, mustard, collards	3 (3.3 bunches)	2 (5 bunches)
Cabbage	27 (3.8 heads)	28 (3.9 heads)
Canned tomatoes	40 (6.1 lbs.)	45 (7.0 lbs.)
Tomato paste or sauce	59 (3.2 lbs.)	43 (3.0 lbs.)
Grapefruit	3 (5 no.)	4 (10.7 no.)
Oranges	27 (12.6 lbs.)	35 (13.7 lbs.)
Canned citrus juice	11 (11.3 lbs.)	25 (16.7 lbs.)

It is interesting that families in the two money value home produced food groups spent about the same amount of money for food. The group with more home produced food purchased less milk and eggs, but seemed to purchase about as much meat, fruits, and vegetables, and even more of specified kinds. Perhaps the value of home production lies in the fact that it makes a more flexible family food dollar—that it makes available funds for more citrus fruits, for a change in meat, for ready prepared products that release preparation time for the homemaker. In this study 83 percent of the families in the lower production group and 88 percent in the higher production group bought bakers' bread during the report month with an average of about 6 loaves per family purchasing, in the lower, and 8 loaves per family purchasing in the higher group. This average was in spite of the smaller families in the group in which there was more home-produced food used.

FACTORS ASSOCIATED WITH HOME-PRODUCED FOOD

There were two types of factors examined as probably related to the family home-produced supply of food. These were: (a) **General family characteristics,** such as family income, race, and type of farm tenure, number members in family and schooling of male head and wife or female head. (b) Other factors including those more directly related to specified practices and to habits and attitudes of individual family members. These included:

1. Knowledge about good diets, production standards, and recommended production and preservation processes.
2. Facilities for food production.
3. Losses through spoilage.
4. Time spent in food production and processing and other work activities.
5. Production tradition, production attitudes, and production planning.
6. Participation in agricultural and home economics groups; reading.
7. The pattern of production and processing by family members as it affects amounts produced.

Figure 1 gives a comparison of percentages of families with specified characteristics such as with higher or lower income, with wife having completed less than 7 grades and with wife having completed 7 grades or more, in the two home production groups. The differences between the percentage of families in the two groups having specified characteristics are in all cases significant.[4] Higher money value of home-produced food was related to higher income, to the form of tenancy in which the operator makes the important decisions as to the farm enterprise, to the white race, to more schooling of male head and wife and to small families.

Any difference in percentages of families in Quitman and Tate Counties with higher and lower money value of home-produced foods can be accounted for in large part by differences in type of farm non-ownership in the two counties. More of the Quitman County than the Tate County families were farm sharecroppers and farm wage hands.

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[4] Differences between percentages are considered significant if they are large enough so that they would not occur through chance variation in sampling more frequently than 5 times in 100. For convenience the following publication was used: Vernon Davies, Table Showing Significance of Differences Between Percentages. Washington Agricultural Experiment Station Circular No. 102, Sept., 1950.

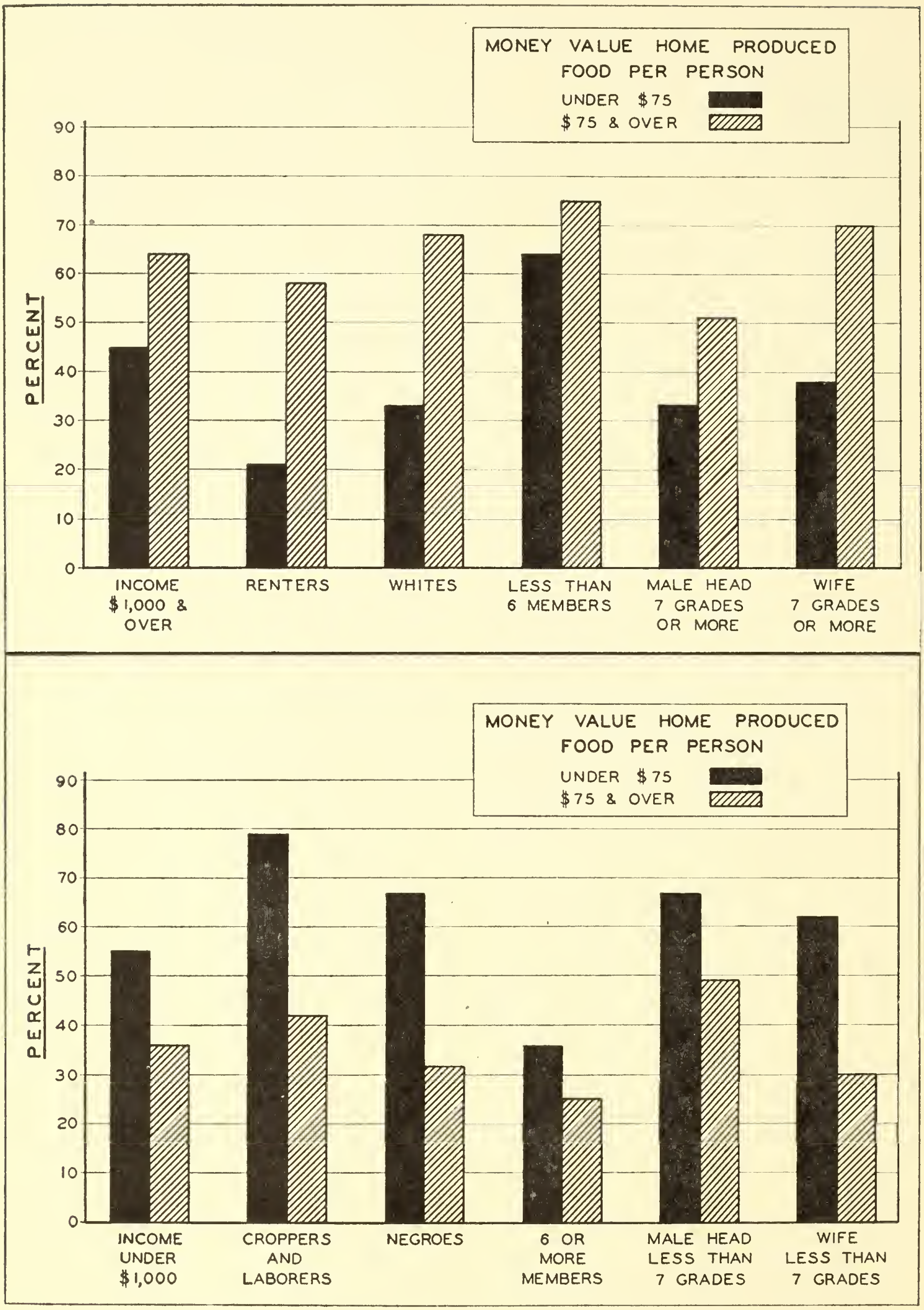

Figure 1. A comparison of percentages of families with specified characteristics having money value of home-produced food of under $75 and of $75 and over per person per family.

Practices and Knowledge About Practices

In planning the study on factors affecting the home-produced food supply, it was thought that an important one might be the knowledge homemakers had about an adequate diet and about standards for good production and recommended production practices. The schedule was designed to determine knowledge homemakers had of the Basic Seven food groups, of standards for egg and milk production, best feed for laying hens and hogs, and of treatment for garden bugs and poultry diseases.

Because production of one group of families was considerably higher than another, it might be assumed that more families would be serving foods in each of the Basic Seven food groups and that better production and processing practices were being followed. Some discussion will be given, therefore, about these actual practices before comparing information concerning same had by homemakers in these two groups of families.

One of the questions on the schedule was: "What foods have you served at meals and between meals in the last 24 hours?" It was from this list of foods served at the morning, noon, and evening meals and between meals that the percentage of families having one or more foods in each of the Basic Seven food types was obtained. These seven types are (1) green and yellow vegetables (2) citrus fruits and tomatoes (3) other fruits and vegetables (4) meat (including poultry and fish), eggs, dried legumes (5) milk, cheese, ice cream (6) whole wheat, restored and enriched cereals (7) butter and fortified margarine. Reports were obtained on this question from 440 families.

There was a significant difference in percentage of families using foods from each food type except citrus fruits and tomatoes and whole wheat, restored, and enriched cereals (Figure 2).

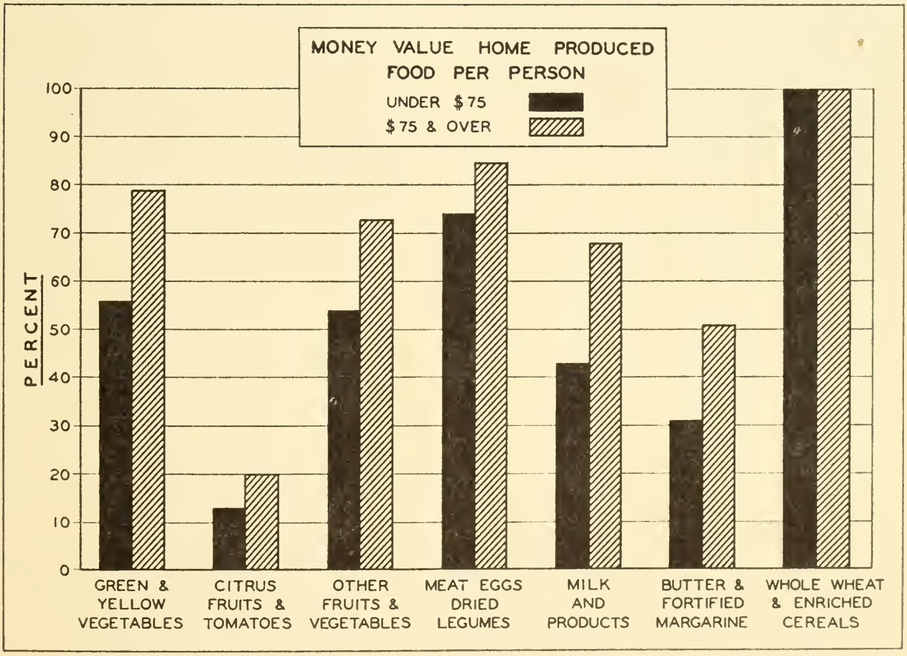

Figure 2. Percentage of families with lower and with higher money value home-produced foods who used one or more foods in each of the Basic Seven types on report day.

Very few families in either production group had used either citrus fruits or tomatoes on the report day. All families had used enriched cereal, since by Mississippi law all white flour and bolted corn meal and grits must be enriched.

Homemakers were asked about the number of hens they had and how many eggs these hens had laid in the past 24 hours. They were also asked about the number of cows they were milking now and number of gallons of milk from them in the last 24 hours. From Mississippi State College poultry and dairy specialists, definitions for good layers and good milk producers at season of interview were set up. Good layers were defined as hens that laid .6 or more eggs per day. Thus if a family had 10 hens and these hens laid 7 eggs, the family had good layers. Good milk producers were defined as cows that averaged 2 gallons or more of milk per day. According to these definitions, about 20 percent of the families with hens had good layers and about 40 percent with cows giving milk at the time of the interview had good milk producers. Seventy-three percent of the families in the lower home-produced food group and 97 percent in the higher group owned hens. The percentages owning cows (or having use of same) were 23 and 87, respectively.

No significant differences were found in percentages of families in lower and higher production groups having good layers and good milk producers. The little difference in the two groups may have been related to the season in which the study was made.

Several questions were included in the schedule relating to specified production and processing practices, and asked women in families carrying on such activities. These included: (1) What are you feeding your hens now? (2) During the past year has your poultry had any kinds of disease? If yes, what? What did you do? (3) What are you feeding your hogs now? (4) Have you had any trouble with bugs in growing vegetables? If yes, what? What did you do? (5) What method did you use in canning tomatoes?

Homemakers in relatively more of the lower food production families (37 percent) than in the higher food production families (17 percent) reported feed for hens as food garbage, waste from feeding livestock, and green material such as grass. Higher food production families most often produced feed for their hens, generally corn. But only 10 percent of the lower production group and 21 percent of the higher production group fed hens laying mash (feed including a good protein supplement), recommended by poultry specialists.

About one-fourth of the homemakers in each production group reported poultry diseases during year preceding the interview. About one-third of the women in each group said they did not know the name of the disease. Diseases most often mentioned were cholera and roup. According to the Agricultural Extension Poultry Specialist, the two main diseases of poultry in the state are cold and leukosis.

Figure 3 shows what women in each of the two production groups did about poultry diseases. There is a significant difference in percentage of families in the two groups who used a purchased remedy. The higher production group more often used this type of treatment.

Home remedies included such treatment as giving poultry coal oil in cornmeal and giving them bluing water. A wide assortment of purchased remedies were mentioned, such as Walk-O-Tablets, sulmet solution, Dr. Legear's powder.

According to Animal Husbandry specialists, hogs should have a good protein supplement (such as soybean meal, milk) along with grain. In this study 15 percent of the families with lower production values and 26 percent with higher production values reported the use of such proteins.

Fifty-five percent of the families in the lower and 78 percent in the higher production groups had hogs. Families with higher money values of home-produced food were more likely to produce their hog feed and less likely to depend on garbage and hogs rooting around premises for their own feed.

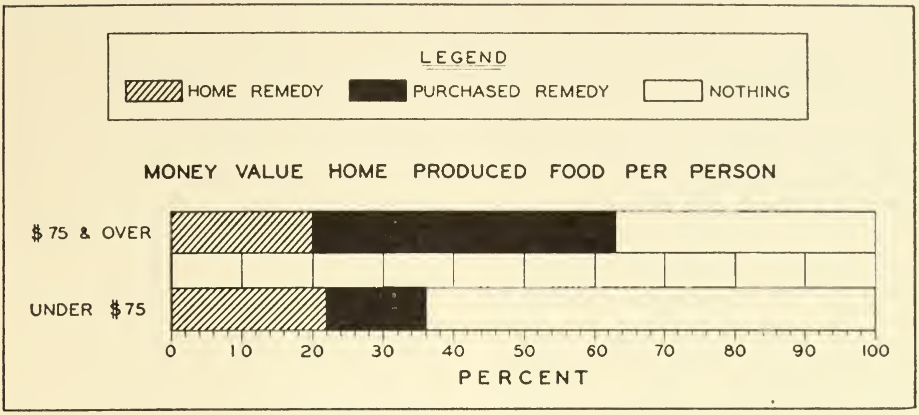

Figure 3. Percentage of families with lower and higher money values home-produced foods classified by methods used in treating poultry diseases.

Ninety percent of the families in the lower production group and 98 percent in the higher production group had had a garden at some time during the report year. Most of these families (71 percent in the lower and 82 percent in the higher production groups) reported trouble with garden bugs. Figure 4 shows what these families did about this trouble with these garden pests. There was a significant difference in the percentage of families who did nothing (the percentage was much higher for the low production group of families) and in the percentage of families using commercial dusts and sprays (the percentage was much higher for the high production group.)

As will be noted, quite a number of families in both groups used cotton poison and DDT in their vegetable garden. These two types of chemicals are usually not recommended for vegetable gardens since little is known about how much of these chemicals the plants take up. There are other poisons that will do a more effective job.

Home remedies included for the most part picking the bugs off the plant and sprinkling the vegetables with ashes.

The question about the method used

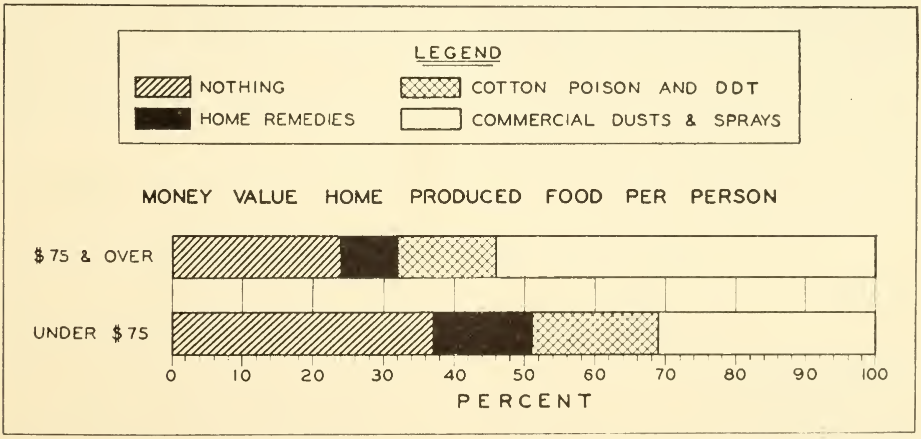

Figure 4. Percentage of families with lower and higher money values home-produced foods classified by methods used in treating garden bugs.

in canning tomatoes yielded no significant differences between homemakers in lower and higher production families. Seventy-six percent of the homemakers in families in the former and 95 percent in the latter groups had themselves canned tomatoes once or more. The methods used by these homemakers were as follows:

Methods of Canning Tomatoes	Money value home-produced food	
	Under $75 per person per family	$75 and over per person per family
	Percent	Percent
Open kettle	55	49
Water bath	29	23
Pressure Cooker	15	23
Combination of two of the above	1	5

The water bath method (or processing jars in a boiling water bath) is the method recommended for canning tomatoes by the Human Nutrition and Home Economics Services of the U. S. Department of Agriculture as well as the Mississippi Extension Service. Additional information was obtained from women using the water bath or pressure cooker methods as to what they did when there were air bubbles in the jar after packing, or not enough liquid. No significant differences were found in replies of women in the two groups of families.

After homemakers reported on foods served at and between meals in the last twenty-four hours, they were asked if there were any important kinds or classes of foods your family didn't have you think they should have had. There were 236 women in the lower food production group and 178 in the higher food production group who had one or more of the basic food types missing in their day's menus. The opinions of these 414 women concerning missing food types were as follows:

Opinion of Homemakers	Families with one or more missing food types having money value home-produced food	
	Under $75 per person	$75 and over per person
	Percent	Percent
Thought no type or kind of food missing	47	67
Thought one or more food types missing but unable to give all missing types	47	25
Recognized all missing types	6	8

Families in the lower production group had an average of 3.4 of the 7.0 basic food types not represented on yesterday's menu and homemakers in these families reported an average of .72 types per family not represented. Families in the higher production group had an average of 2.4 food types not represented and homemakers in these families reported an average of .46 food types not represented. Both groups reported about one out of five missing food types. One cannot, therefore, say that poorer diets of the low production families were related to lack of information of homemakers in these families. They had more of the Basic Seven food types missing, but they reported more; in fact, relatively the same as homemakers in high production families.

There were two questions included in the schedule to determine knowledge of homemakers about production standards. These were: "Do you think you have good layers?"; "Do you think your milk cow is a good producer?" Twenty-eight percent of the women in the low production group were correct about production of their hens and 42 percent about the production of their milk cows. The proportions of women who were correct in higher production families were 30 and 49 percent. In other words, there was little difference in percentage of women in families of the two production groups having correct information about production standards. It is interesting to note, however, that more women were correct about milk production than egg production. The group owning milk cows was, however, a smaller and more select one.

Nor were there significant differences in opinions of these two groups of homemakers about the way hens and hogs should be fed. About one-fourth of the women in families not feeding a protein supplement to chickens and nearly one-third not feeding it to hogs said they should be feeding it. The remainder (or the majority) thought their way of feeding a good way.

Replies obtained from women in the two groups concerning information about a better way to treat poultry diseases and garden bugs revealed few differences. The majority of women who did nothing or used a home remedy had not heard of a better method. This proportion was, however, relatively larger for poultry diseases than garden bugs. Eighty-five percent of the women in the low production group and 80 percent in the high production group did not use the recommended method for canning, or at least all techniques which are customarily included in directions such as, removing air bubbles before sealing. But 81 percent of the women in the former and 76 percent in the latter groups thought the way they canned tomatoes a good way. From comments made it would seem the criteria of a good method is a method in which the tomatoes do not spoil. The tomatoes may, of course, keep, yet a great deal of vitamin C be lost in the canning process. Recommended methods take into consideration conservation of this important vitamin.

Facilities for Food Production

Data were obtained on three types of production facilities. These were (1) pasture land (2) land suitable for growing vegetables (3) fenced land to keep hogs.

As will be noted, higher production families more often had each of these three facilities, as is shown below:

Facilities	Families having money value home-produced food	
	Under $75 per person	$75 and over per person
	Percent	Percent
Pasture land	54	93
Suitable garden land	85	94
Fenced land for hogs	63	89

Of those families who owned milk cows, 89 percent in the lower production group and 95 percent in the higher production group had pastures. The proportion with gardens and with hogs who had suitable garden land, and fenced-in land for hogs was 91 for both gardens and hogs for families in the lower production group and 95 for both of these for families in the higher production group. These differences are not statistically significant. The lower production group of this study cannot be characterized as one that takes less advantage of facilities than the higher production group. It can, however, be characterized as less often having the facility. It may not always be economically sound to provide land for every tenant to produce at home. But certainly a supply of home-produced food makes for better health and hence more useful and efficient workers.

Losses Through Spoilage

Homemakers were asked to give a record of home-produced foods lost through spoilage during the report year. It was thought that greater spoilage of foods stored for home use might account at least in part for less home-produced food. Information was obtained from each homemaker on the food spoiled, the amount spoiled, kind of spoilage, and how the food was stored. The percentage of families in the groups reporting spoilage was:

Food	Money value home-produced foods	
	Under $75 per person per family	$75 and over per person per family
Sweet potatoes	12 (3.4 bu.)	18 (4.5 bu.)
Irish potatoes	8 (3.7 bu.)	13 (2.7 bu.)
Canned fruits and vegetables	7 (6 qts.)	11 (5 qts.)
Cured meat	6 (53 lbs.)	9 (98 lbs.)
Onions	4 (2 pecks)	2 (2 pecks)
Dried peas and beans	1 (7 pecks)	2 (2 pecks)

In brackets to the right of the percentage is given the average amount of food spoiled by families reporting spoilage.

There were no significant differences between the two groups of families in percentage having had spoilage in any of the foods named. That spoilage was no special problem was no doubt related to the fact that there was for most families of this study, not very much stored or processed food to spoil.

"Rotted" was the type of spoilage most often reported for sweet potatoes, Irish potatoes, and onions. These foods were generally stored in the barn. The potatoes were placed in a crib, the onions in a sack hanging from the wall. The onions were often Bermudas.

The two types of meat spoilage most often mentioned were (1) souring, or souring at the bone (2) skipper flies. The meat was usually stored in the smoke house, or in some room of the house.

Type of spoilage of canned vegetables and fruits was most often described as "soured." Several homemakers mentioned bad rubbers and jars. More quarts of tomatoes were reported as spoiled than quarts of non-acid vegetables. It may be that more care was taken in canning non-acid vegetables such as peas, corn, beans, since they are known to need special care, (about three times more home-produced non-acid canned vegetables than canned tomatoes were reported as used.) Most women said they kept their canned vegetables and fruits in the house, often in the kitchen.

Time Spent in Food Production and Processing and Other Work Activities

Each homemaker interviewed was asked to estimate the time spent during the week preceding the interview by herself and the male head of the family in (1) housework, including care of children (2) food production and processing for home use (3) care of yard and premises (4) gainful work (or assistance in gainful work). In interpreting time expenditures of men and women of this study, one would, of course, want to hold in mind that the study was made in May and June. This was during the "cotton chopping" season, a period of great activity on the cotton farm. It was before the season of greatest food processing activity.

The percentages of male heads and of wives or female heads who did work of the specified kinds during the report week is shown in Table 2. There were significant differences in percentages of male heads and of wives or female heads in the two groups who carried on food production and processing activities of various kinds. A larger proportion of both men and women in the $75 or more per person production group carried on such activities. The wife and male head in the higher production group spent 11 and 4 hours, respectively, in food production and processing activities during the report week. Those in the lower production group spent less or 6 and 2 hours. (Table 2).

Garden work and care of milk cows, including milking, were the two kinds of food production activities most often carried on by the male heads. The percentage of wives or female heads of families in the two groups spending time during report week in various kinds of production activities is shown below. To the right of these percentages is given average number of hours (rounded to nearest hour) spent by those devoting time to such activities.

Table 2. Percentage of male heads and wives or female heads who did work of specified kinds and average hours spent by those who did the work during report week in families with money values of home-produced foods under $75 per person and in families with money values of home-produced foods $75 and over per person.

Kind of work	Male heads Money value home-produced food		Wives or female heads Money value home-produced food	
	Under $75 per person	$75 and more per person	Under $75 per person	$75 and more per person
	Percentage of families doing			
Housework and care of children	4	4	100	100
Food production and processing	22	44	80	100
Work in yard and premises	3	1	21	39
Gainful work	95	97	70	64
Total (specified kinds above)	96	98	100	100
	Average number of hours by those having the activity			
Housework and care of children	19	3	39	42
Food production and processing	2	4	6	11
Work in yard and premises	2	1	2	3
Gainful work	51	53	43	38
Total (specified kinds above)	54	54	76	79
Number persons	225*	189**	244***	194

*In 24 families there was no male head.

**In 5 families there was no male head.

***In 2 families there was no wife or female head and in three families the wife had been away visiting.

Type of work	Money value home-produced foods: Under $75 per person per family	$75 and over per person per family
Garden work	60 (4)	71 (5)
Poultry work	57 (3)	87 (4)
Work with milk cows	17 (3)	72 (5)
Churning	18 (3)	68 (2)
Food processing	2 (2)	10 (3)

There were significant differences in percentage of women from families in the two groups who spent time during report week in all five of the kinds of production activities listed. Higher values of food for home use are related to time expenditures on such activities by the homemaker.

In only one of the other three types of work activities listed in Table 2 was there a significant difference in percentage of wives or female heads in the two groups of families doing. This difference was in those spending time in work in yard and premises, such as working in flowers, mowing lawn, and trimming shrubbery. The same kind of women who spent more time in food production for family use spent more time caring for surroundings around the house.

As will be noted, all women spent some time in housework or care of children during the report week (Table 2). House-work activities included (1) food preparation and cooking (2) washing dishes and cleaning kitchen (3) cleaning other parts of the house (4) washing clothing and household textiles (5) ironing.

There was little or no difference in percentage of women in the two groups carrying on various housework activities during the week. Practically every woman in both groups had spent some time doing all five of these kinds of housework. But there was a significant difference in percentage of women in the two groups who had spent time caring for babies and young children. Forty-five percent of the women in families of the lower food production group and 26 percent in families of the higher food production group had spent some time in this activity.

From these percentages it might seem that more frequent presence of young children in the lower production group of families might account for lower values of home-produced food. When one consults, however, Table 2, one finds that these women in the lower money value food group average 39 hours per week doing housework and caring for children. Women in the higher money value food group of families averaged 42 hours. Figure 5 shows average hours spent in these activities by women in the two groups of families.

Production Tradition, Production Attitudes, and Production Planning

There were two questions asked that had to do with production tradition, or passing along production information from parents to children. Homemakers were asked: (1) Do you know how to milk? If yes, when did you learn? (2) Have you ever canned any foods? If yes, when did you learn to do it?

Twenty-nine percent of the 247 wives or female heads in families of the lower value group and 9 percent of the 194 wives or female heads in families of the higher value group said they did not know how to milk. Of the remaining who said they knew how to milk, the percentages saying they learned when a child and after adulthood were as follows:

When learn to milk*	Money value home-produced food: Under $75 per person per family	$75 and more per person per family
When a child	63	84
Adulthood	6	4

*A few women gave no report or said they did not know. Others had not learned.

The difference in percentages of women of the two production groups who had learned to milk when they were children is statistically significant. Higher home-produced food was found in the group of families where the homemaker had learned to do this activity when a child.

Women in the two groups of families responded about the same to the question about when they learned to can. Only 5 percent in families of the lower group and 2 percent in families of the higher group said they had not canned any foods. A little more than 60

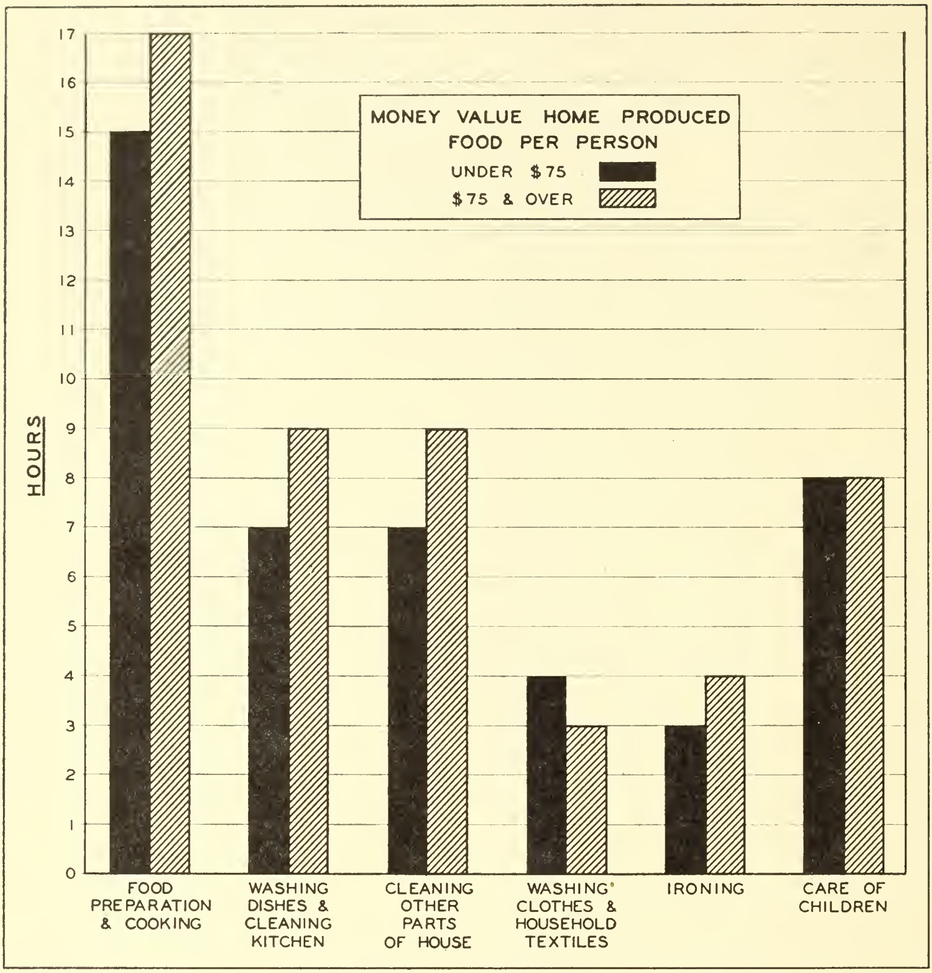

Figure 5. Average number of hours spent in various housework activities and in child care by wives and female heads spending some time in these activities classified by amount of home-produced food.

percent of the women in each group of families said they learned to can when they were children. About 30 percent in each group of families said they learned to can after they reached adulthood.

As noted, the majority of women in both groups learned these two work activities when they were children. But a relatively high proportion of women learned to can after they reached adulthood.

Two types of questions were used in studying attitudes towards home production: (1) a question designed to find out if the male head and homemaker in these families liked home-produced food (2) a question designed to find out if the male head in these families enjoyed work in connection with home production.

To find out whether or not the male head and wife liked home-produced food, two typical dinner menus, one of foods commonly home-produced, the other of foods commonly purchased, were set up. These dinners were:

Dinner (a)	Dinner (b)
Wieners	Fried middling or side meat
Boiled dried beans	Turnip greens
Boiled rice	Baked sweet potatoes
Loaf bread	Cornbread
Canned peaches (store bought)	Egg pie
Coffee	Buttermilk

Each homemaker was asked: You have the food to cook either one or the other of the following two dinners. Which would your husband like best? Why? Which would you like best? Why?

Seventy-five percent of the homemakers said Dinner (b) for themselves and 73 percent Dinner (b) for their husbands in families of the lower production group. In families of the higher production group 83 percent of the homemakers said Dinner (b) for themselves and 80 percent Dinner (b) for their husbands.[5] From this it would seem that most of these women and men would prefer home-produced food, with no differences in individuals of lower and higher food production families. It is realized, of course, that if other purchased or home-produced foods had been in the dinners that the response might have been different. But these foods were those commonly used by many of the families.

The question to find out if the male head enjoyed work in connection with home production was worded as follows: What food production tasks does your husband like to do best? Women in the two groups of families reported these best-liked food production activities of their husbands as follows:

	Money value home-produced food	
Food production activities husband likes best*	Under $75 per person per family	$75 and more per person per family
	Percent	Percent
(1) Livestock, i.e., work with hogs and cows	25	42
(2) Garden, truck crops	21	24
(3) Field crops, i.e., corn, watermelons	24	15
(4) All other	6	5
(5) Likes none	14	5
(6) Has no time to do	5	2
(7) Doesn't know	3	4
(8) No report	2	3

*"All other" includes poultry, work with both cows, hogs, and garden, etc. There were 225 husbands in the lower and 189 in higher production groups of families.

The only significant differences in replies of women in the two groups of families regarding food production activity liked by their husbands was in the percentage in the two groups who replied (1) Livestock, etc., and (5) Likes none. Liking to work with livestock was much more often mentioned by wives in the group of higher food production families. Liking no food production activity was more often mentioned by wives in the lower production group.

In developing the schedule the possibility of including questions regarding food production planning for home use was investigated. After some pretesting it was decided that the best method of getting this type of information would be indirectly. The questions to get information on this point were: Do you think you are going to have more, the same, or less home-produced foods for the family during 1952 than during 1951? If more, which ones? Can you give a reason for having more this year? If less, which ones? Can you give a reason for having less this year?

In Figure 6 is shown the percentage of homemakers giving various replies to amount of food production this year as compared with the previous year (1951). As will be noted, 52 percent of the homemakers in the lower production families and 69 percent in the higher production families said they would have more food this year. This difference in percentages is statistically significant. Women from the low production group of families more often said "Less" or "About the same" as in 1951.

Those 129 homemakers in families of the lower food production group and the 133 homemakers in families of the higher food production group who said they would have more food this year (1952) gave as their reasons:

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[5] Further analysis of these data are contained in an article "Attractive Menu Items" accepted for publication in **American Journal of Dietetics Association.**

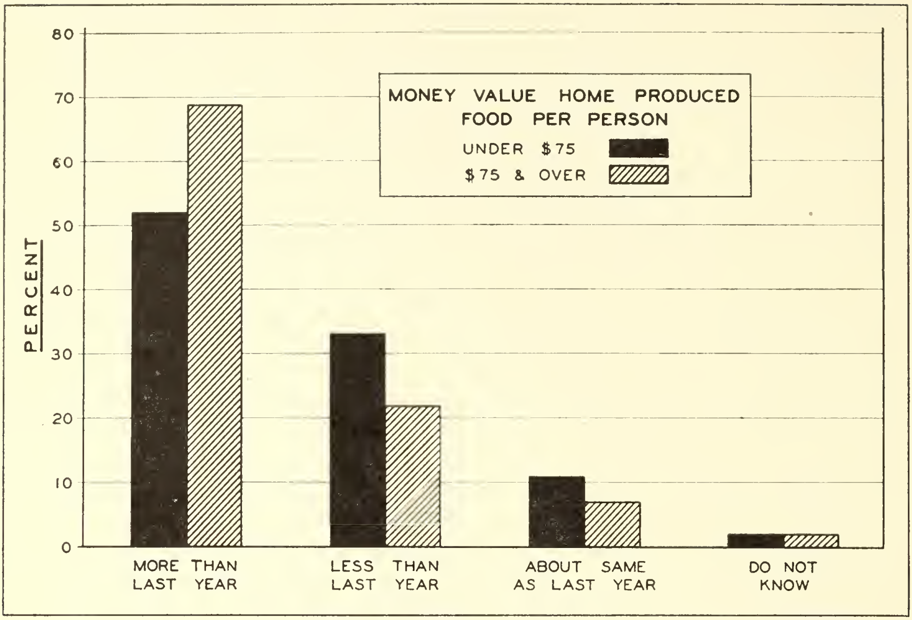

Figure 6. Percentage of families with lower and higher money values of home-produced foods classified by replies of homemakers to question about amount of home-produced food 1952 as compared with year preceding interview, 1951.

Reasons for more food products for home use 1952 than 1951	Money value home-produced food: Under $75 per person per family	Money value home-produced food: $75 and more per person per family
	Percent	Percent
Planted more, have new cow, have more hogs and hens	49	54
Season or growing better	9	15
Am doing more planning, trying more	6	9
Better land	13	5
More assistance on part of family members this year	1	2
Wishful thinking (i.e., need it more, hoping for more)	11	6
Better fencing	2	0
All other reasons	4	7
Reason not given	5	2

It is interesting to note that women in the two groups gave about the same reasons for having more in 1952 than 1951. Few mentioned planning in either group. But the first reason listed might be said to represent the practical phases of planning. This reason (planted more, have new cow, have more hogs and hens) was mentioned by about one-half of the women in both groups.

Reasons given for having less home-produced food in 1952 were:

Reasons for less food products for home use 1952 than 1951	Money value home-produced foods: Under $75 per person per family	Money value home-produced foods: $75 and more per person per family
	Percent	Percent
Planted less, not as good cow, fewer hogs and hens	15	7
Season or growing not so good	49	66
Got a late start, didn't get a good start	7	2
Poorer land	6	9
Less time on part of family members this year	10	2
All other reasons	11	12
Reason not given	2	2

Most of the homemakers in both groups of families who said they would have less food during the coming year (82 in families of the lower group and 43 in families of the higher group) attributed this fact to weather conditions. As will be noted, women in families of both production groups gave about the same reasons for having more and less home-produced food with no significant differences in replies.

Participation in Agricultural and Home Economics Groups; Reading

Each homemaker interviewed was asked whether the family had ever been in the Farmer's Home Administration or Farm Security program and if any one now a member of the family had taken the Veteran's Farm Training Program. Also, she was asked to give information on participation, both past and present, for each member now in the family who was of 10 years of age or more—in 4-H Club; Future Farmer or Homemaker Club; high school agriculture or high school home economics; college agriculture or home economics; women's Home Demonstration Clubs; Farm Bureau; and other agricultural or homemaking clubs. In Figure 7 is shown both the percentage of families with one or more members who had participated or were participating in the specified agricultural and Home Economics groups and the percentage who had never participated classified by money value of home-produced food. This chart is limited to agricultural and Home Economics activities in which there was a statistically significant difference between families of the two production groups.

In many of the agricultural and home economics activities about which questioned, our sample had so few participants that differences that probably existed were not indicated. When the number of cases is small, it takes large differences to be statistically significant.

Thirty-two percent of the 111 families in the lower production group with one or more sons 10 years and over at home had one or more of these who were or had participated in the 4-H Club. The percentage of the 83 families in the higher production group with one or more sons at home who had or had had one or more participants in the 4-H Club was 52 (Figure 7). Percentages for families with sons who were or had been FFA members were 3 and 13. The Future Farmers of America (FFA) is an activity in connection with the agricultural teaching program in public schools. Students of agriculture or those who have been students less than 3 years ago are eligible. Sons of many tenant farmers are retarded in school and never reach the grades in which agriculture is taught. This is also the case with home economics for daughters, though not to as great extent, since the economic worth of daughters in making the farm crop is not as great as that of sons.

It would seem from Figure 7 that 4-H Club training for girls as well as for boys is a mighty good guarantee of higher food production for family use. Thirty-four percent of the 110 families of the lower production group with girls 10 years and over at home and 54 percent of the 78 families of the higher production group with girls 10 years and over at home had one or more who were or had been 4-H Club members.

Very few of the wives or female heads included had been or were members of a home demonstration club, but it is interesting to note that the difference in the two groups of families with the wife or female head having such experience was statistically significant (4 percent as compared with 11 percent.)

At the time of the interview, male heads, wives, sons, and daughters in the majority of families in neither group were participating in one or more agricultural or home economics group programs of any kind. But relatively more of the members of the higher production group of families were participating as is shown:

Individual participating in one or more programs	Money value home-produced foods Under $75 per person per family	 $75 and more per person per family
	Percent	Percent
Male heads	2	8
Wives or female heads	5	14
Sons	27	41
Daughters	24	45

Differences in percentage participating at present are, however, statistically significant only for the two female groups. The home economics program probably gives more emphasis to food for home consumption than does the agricultural program.

Every homemaker was asked to list agricultural and homemaking papers

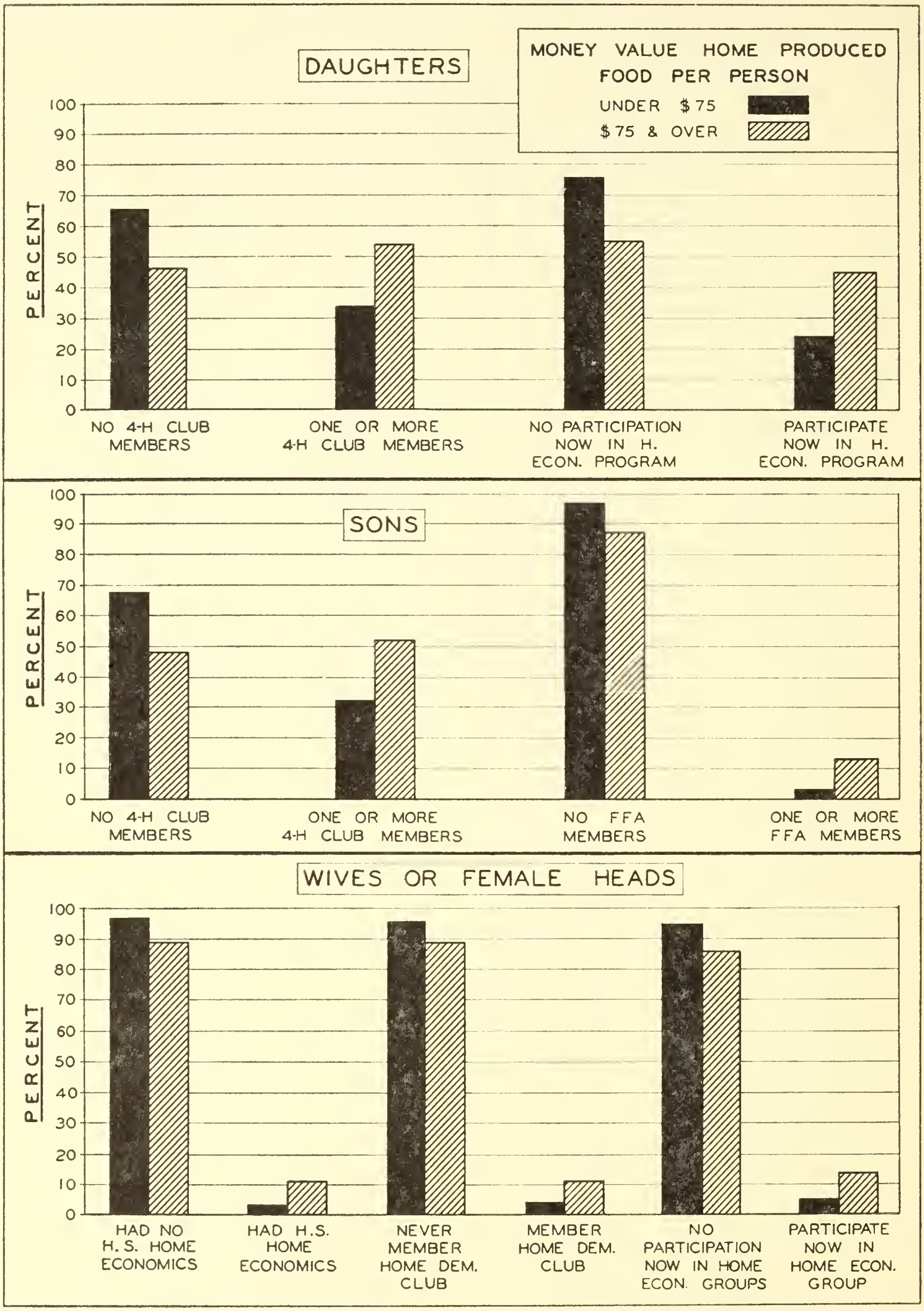

Figure 7. Percentage of families with one or more members who had participated or who were participating in specified agricultural and home economics groups and the percentage with no members who had participated in these specified agricultural and home economics groups classified by money value home-produced food per person.

and magazines to which the family now subscribes: There was a significant difference in percentage of families in the two groups taking one or more of these papers and magazines. In the lower production group 19 percent of the families took one or more of such papers and magazines. In the higher production group, the percentage taking one or more was 46.

The two papers or magazines most often reported by the families were **Progressive Farmer** and **Southern Agriculturist (Farm and Ranch).** Those families who subscribed to one or more of agricultural and home economics publications averaged 1.6 publications per family. There was no difference in average number of papers and magazines by families in the two groups subscribing.

The Pattern of Production and Processing by Family Members

Homemakers were asked whether or not certain food production and processing activities had been carried on in the home during the past year, and if so to list each individual 10 years and over who had engaged either as the principal worker or assistant in such activities. These activities included: plow garden, hoe garden, decide vegetables to plant, decide amount of space for each, gather vegetables, prepare vegetables for canning, can, feed chickens, gather eggs, decide number of eggs to sell, feed hogs, decide when to kill hogs, kill hogs, dress hogs, make sausage, make lard, milk cows, and churn. In addition, information was obtained on which of these members buy the groceries.

Plowing the garden was the activity in which fewest members per family engaged (an average of 1.0 member per family with gardens in both groups.) Hoeing the garden was the activity in which most members per family engaged (an average of 1.8 members per family with gardens in the lower production group and 1.9 members per family with gardens in the higher production group.) There was no difference in average number of members doing the 18 tasks in families of the two groups performing such tasks. But there was a difference in the two groups in family members who performed these tasks.

The number of male heads, wives or female heads, and children 10 years and over working during the past year on the 18 production and processing tasks in families of the two groups and the percentage which these three groups of family members were of the working force were:

Persons working on production and processing tasks	Money value home-produced foods			
	Under $75 per person per family		$75 and more per person per family	
	No.	Pct.	No.	Pct.
Male heads	986	28.67*	1271	32.67*
Wives or female heads	1647	47.89	1869	48.05
Children	806	23.44*	750	19.28*
Total	3439		3890	

*The difference in percentages of the two groups was highly significant.

About the same percentage of workers on these production and processing tasks in both groups of families were wives or female heads. These women constituted nearly one-half of the labor supply. But there was a significant difference in percentage of the labor supply in the two groups of families who were male heads and children. The higher production group of families had relatively more male heads, relatively fewer children. While the lower production group of families had relatively fewer male heads and relatively more children.

In Table 3 is given percentage of total workers for the 18 specified production and processing tasks in families of the two money value food groups who were male heads, sons, wives or female heads, and daughters.

As previously mentioned, data were also obtained on members 10 years and over who had bought or helped to buy groceries during the past year. Families in the two groups were classified according to sex of members who bought groceries as follows:

Who bought groceries	Money value home-produced foods Under $75 per person per family	 $75 and more per person per family
	Percent	Percent
Male members only	59	47
Female members only	18	20
Both male and female members	20	33

The proportion of "male members only" in the lower group who bought the groceries is significantly different from the proportion of "male members only" in the higher group who bought the groceries. On the other hand, the proportion of both male and female members in the higher group who bought the groceries is significantly different from the proportion of both male and female members in the lower group who bought the groceries. Sixty-two percent of the total number in the lower group who bought groceries were male heads in the family. The proportion of total food buyers in the higher group who were male heads was almost as large as 58 percent. But this job of buying groceries was more often shared with the wife in the families having higher food production.[6]

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[6] In three percent of the lower food production families someone outside the family bought the groceries, or no report was given by the family.

Table 3. Percentage of total workers for specified production and processing tasks in families of the two production groups who were male heads, sons, wives or female heads, and daughters.

Activity	Male heads Money value food less than $75 per person	 Money value food $75 and more per person	Sons Money value food less than $75 per person	 Money value food $75 and more per person	Wives or female heads Money value food less than $75 per person	 Money value food $75 and more per person	Daughters Money value food less than $75 per person	 Money value food $75 and more per person
Plow garden	80	86	20	14	—	—	—	—
Hoed garden	17	20	15	14	49	47	19	19
Decided vegetables to plant	23	26	1	3	73	67	3	4
Decided amount of space for each vegetable	25	28	1	2	72	67	2	3
Gather vegetables	4	5	5	4	71	75	20	16
Prepare vegetables for canning	6	6	6	7	66	66	22	21
Canning	2	2	0	2	81	78	17	18
Fed chickens	10	16	11	15	58	56	21	13
Gathered eggs	5	8	13	14	55	58	27	20
Decide number eggs to sell	11	11	7	1	78	85	4	3
Feed hogs	50	62*	28	24	17	11	5	3
Kill hogs	75	84	21	15	3	1	1	0
Dress hogs	66	76	28	17*	4	7	2	0
Make sausage	27	35	16	9	50	50	7	6
Decide when to kill hogs	79	89	10	5	10	6	1	0
Make lard	18	30*	6	3	66	61	10	6
Milk cows	27	36	23	13	34	43	16	8
Churn	1	4	1	1	72	77	26	18

*Difference in percentage of two groups is statistically significant.

no 513

BULLETIN No. 513 MARCH, 1954

PRODUCTION CREDIT ASSOCIATIONS IN MISSISSIPPI

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

MITCHELL [illegible]
DEC 7 1954
MISSISSIPPI STATE COLLEGE

ACKNOWLEDGMENTS

Acknowledgments are made to the secretary-treasurers of local production credit cooperative association who furnished information on the operating structure of their organizations, and to the District Production Credit Corporation, New Orleans, Louisiana, for cooperation in furnishing records on the financial structure and methods of operation of the production credit system.

Appreciation is extended to Mr. R. E. Spivey, Jr., Vice-President and Secretary of the New Orleans District Production Credit Corporation; to Mr. T. J. Chambless, Senior Accountant, New Orleans District Production Credit Corporation; to Mr. Fred J. Hurst, Director of Information, Farm Credit Administration of New Orleans; to Mr. M. C. Dougherty, Secretary-Treasurer, Tupelo Production Credit Association; and to Mr. E. E. Kern, Jr., Assistant Professor, Department of Agricultural Economics, for their suggestions on organizing, presentation, and critically appraising the manuscript.

Special thanks are extended to Dr. R. J. Saville, Head, Department of Agricultural Economics, for his cooperation throughout the study and for critically reviewing the manuscript.

The wholehearted support of the various cooperation personnel has made this study possible.

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Production Credit Associations In Mississippi

By LEWIS P. JENKINS

INTRODUCTION

During the early 1930's, agricultural credit was an acute problem. Many farmers in Mississippi, accustomed to borrowing money for production purposes, found themselves in a precarious financial situation. The doors of many lending agencies were not open to them as borrowers, and many mortgage foreclosures were occurring. The institutions which had previously loaned to farmers were unable to extend more credit since depositors were calling for their money. Farmers were faced with very low prices for the products and were unable to pay their debts or to borrow for another year.

It was evident that the credit facilities for agriculture were inadequate and that correction of this situation was of paramount importance. The conditions described above were, to a large extent, responsible for the establishment of the Production Credit system. This system was based somewhat on the early credit associations operating in Arkansas under the leadership of Mr. S. M. Garwood. The second Governor of the Farm Credit Administration, Mr. W. I. Myers, however, was responsible for making several changes, and the system as it exists today was formulated under his direction.

In 1933 the Production Credit Corporation, a supervisory agency, was established by an act of Congress. It is composed of 12 district Production Credit Corporations as shown in Figure 1. Each district agency was established to provide supervision, organizational aid, and capitalization in setting up a local network of Production Credit Associations which would ultimately be farmer owned and controlled. Capitalization, of course, was of the greatest necessity. It is these local units that are now playing an important part in furnishing credit for production purposes to farmers and cattlemen throughout the nation.

The Farm Credit Act of 1933 provides for the appropriation of $120 million, to the Production Credit Corporations, for purchasing capital stock in the local associations. About $7½ million of this

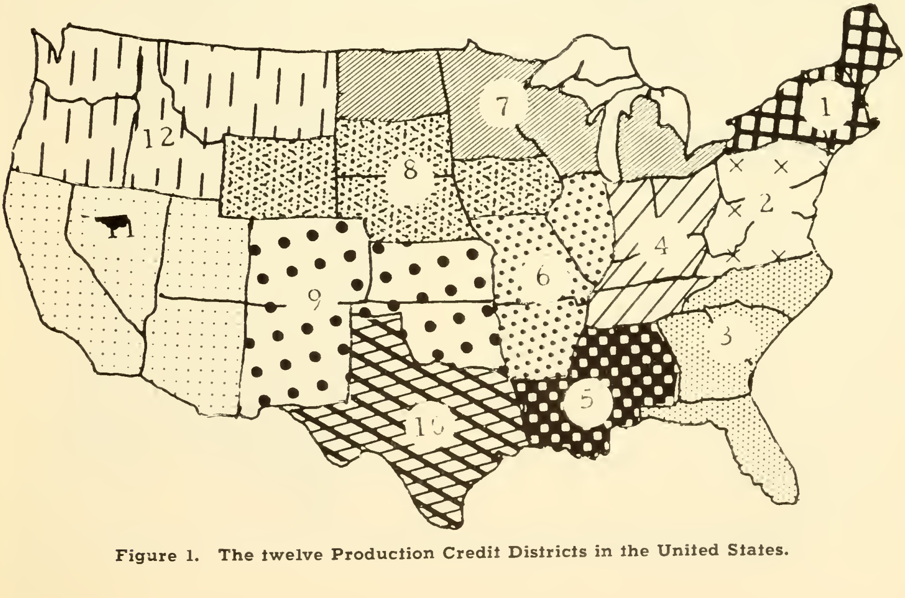

Figure 1. The twelve Production Credit Districts in the United States.

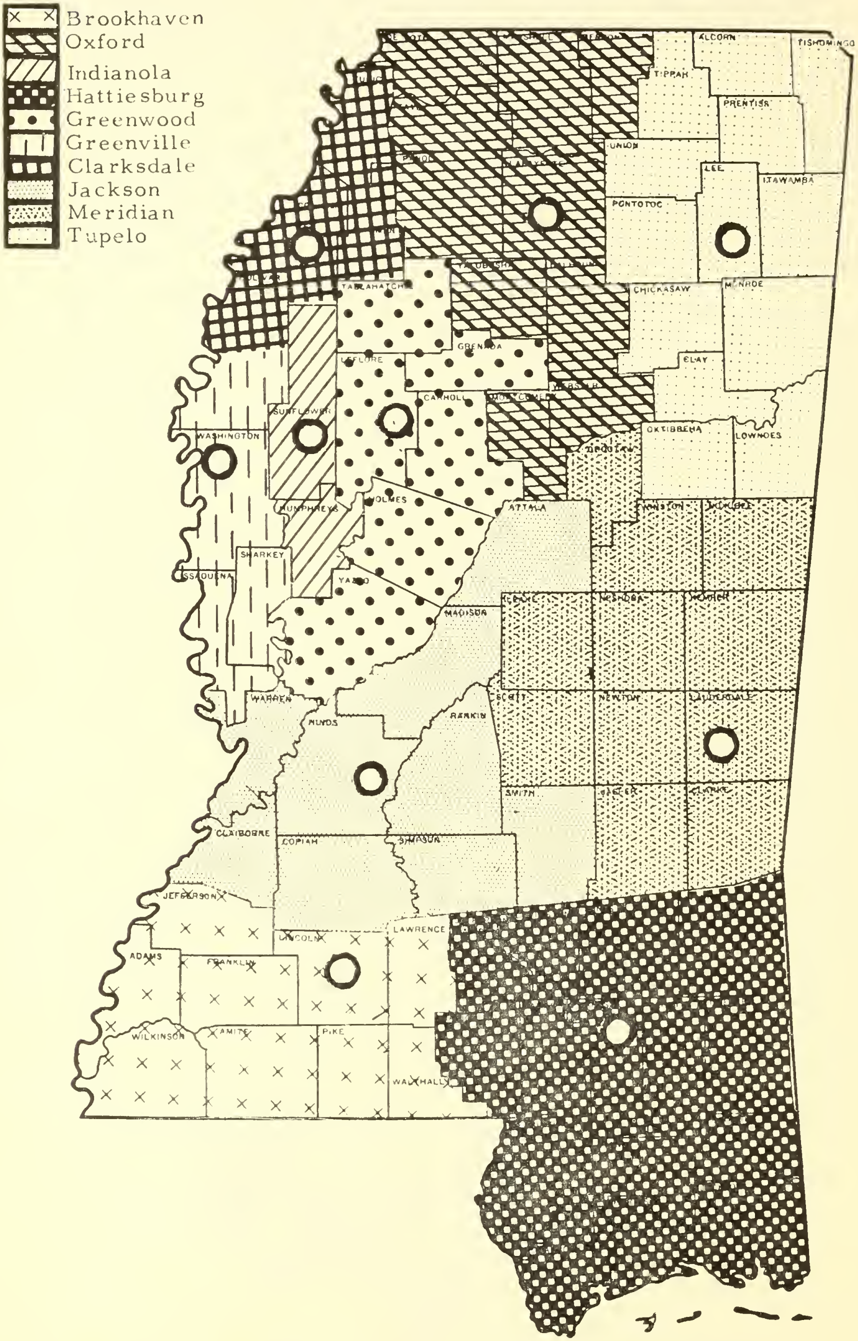
Brookhaven
Oxford
Indianola
Hattiesburg
Greenwood
Greenville
Clarksdale
Jackson
Meridian
Tupelo
ALCORN
TISHOMINGO
TIPPAH
PRENTISS
UNION
LEE
ITAWAMBA
PONTOTOC
CHICKASAW
MONROE
TALLAHATCHIE
GRENADA
LEFLORE
CARROLL
MONTGOMERY
WEBSTER
CLAY
OKTIBBEHA
LOWNDES
SUNFLOWER
WASHINGTON
HUMPHREYS
HOLMES
ATTALA
SHARKEY
ISSAQUENA
YAZOO
MADISON
WARREN
HINDS
RANKIN
SCOTT
NEWTON
LAUDERDALE
SMITH
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
JEFFERSON
LINCOLN
LAWRENCE
ADAMS
FRANKLIN
WILKINSON
AMITE
PIKE
WALTHALL

Figure 2. Ten districts of Production Credit Associations in Mississippi.

sum was allocated to the New Orleans District composed of Alabama, Louisiana and Mississippi. The money was to be used for purchasing Class A stock in local credit cooperatives and for operating the Production Credit Corporation. Money from the sale of Class A stock enabled local associations to provide the reserves necessary to insure sound and economical operations.

The Production Credit Corporation generally purchased stock equal to 20 percent of the volume of loans made by the local associations. This general guide, however, did not prohibit the Corporation from buying more stock if more capital was needed by the local organizations. The $7½ million made available in the New Orleans District was retired at the end of 1952, with the exception of $615,000.

In Mississippi there are ten Production Credit Associations in the state (Figure 2). Each has within its area from one to ten branch offices located in important trade centers easily accessible to farmers.

Progress made by the associations has been made possible by having the (1) District Production Credit Corporation as a supervisory agency, (2) capitalization through the Production Credit Corporation, (3) local Production Credit Association partly-owned and operated by the farmers, and (4) local branch offices easily accessible to the farmers.

The objective of this study was to examine the operating policies and practices of the Production Credit Associations to provide farmers, agricultural leaders, and other interested groups with knowledge of the growth and status of these organizations in Mississippi. It is also anticipated that evaluations can be made which will aid in solving some of the problems confronting these organizations. Also it will enable the management personnel to render better services.

The data were collected by field interviews with the secretary-treasurer of each association, and by obtaining copies of the annual reports for the years, 1949-52. Data were also obtained from the various reports of the District Production Credit Corporation located in New Orleans.

ORGANIZATION AND GROWTH

The associations operating in Mississippi were organized in 1934 by a small number of farmers with the aid of representatives from the Production Credit Corporation. Farmers formed the core of the organization, since they were ultimately to become the owners and to be the users of the associations. An average of 9 farmers in each of 11 separate localities purchased one share of stock each, valued at $5 per share, to form the Production Credit Associations. One association, located at State College, Mississippi, discontinued operations before the end of the first year, and was consolidated with other associations. The remaining 10 associations were still operating at the time of the study.

In addition to the small investment by the farmers, the associations were capitalized by the sale of Class A stock to the Production Credit Corporation. This amounted to $2.8 million at the end of the first year, 1934. Class A, or non-voting stock, was issued for the money borrowed from the Government, whereas, Class B, or voting stock, was issued to the farmers for money invested by them. Regulations prohibited the sale of Class B stock to anyone except farmer borrowers, thus insuring their control.

There has been a continuous growth both in services offered and in financial security (Table 1).

One of the outstanding characteristics of the financial growth of the associations has been the decrease in the amount of stock held by the Government and the increase in the amount held by farmers. In 1934, Government holdings of Class A stock represented almost 100 percent of the total; whereas, the farmers owned 88 percent and the Government only 12 percent by 1952. In 1953, all but $55,000 of the stock held by the Government was retired, and it has been proposed that all the Government-owned stock will be retired by the end of 1954. The as-

Table 1. The financial status of the Production Credit Associations in Mississippi.

Ownership	1934[1]	1940	1946	1952
	Thousand dollars			
Farmers:				
Class A stock	None	7	125	759
Class B stock	29	501	1,084	2,514
Government capital:				
Class A stock	2,871	2,468	1,150	105
Class B stock	None	None	None	None
Reserves	100	741	1,540	3,013
Total assets	3,000	3,717	3,899	6,391

Source: Annual reports, District Production Credit Corporation, New Orleans, Louisiana.

[1] The data for 1934 were not broken down into various classifications, therefore, exact figures were not obtained for the amount of reserves and for Class A stock owned by farmers.

sociations will then become completely farmer owned and operated.

Reserves for the various associations in Mississippi have grown continually and by 1952, $3 million had been accumulated. This represented an average of almost $300,000 per association. By building up adequate reserves, the local associations are able to increase their borrowing capacity from the Federal Intermediate Credit Bank. These reserves mean security to the farmers since their associations will be able to continue lending operations even though economic conditions may be unfavorable at times. The average lending ratio has been about 5 to 1, with peak lendings at 7 to 1. The maximum ratio is 10 to 1.

To supplement the reserves, farmers continued to invest through purchasing both Class A and Class B stock. This investment accounts for about one-half of the total net worth of the associations, which gives added financial security and has enabled them to retire the stock held by the Government.

The Delta associations have grown more rapidly than those in the Upland. This is probably accounted for by the larger size of loans in the Delta. A more detailed comparison in regard to the size and number of loans will be discussed later in this report.

GENERAL OPERATING POLICIES AND PRACTICES

Several general policies of operation are common to all Production Credit Associations. This comparability is the result of the over-all planning and formulating of definite procedures to be followed in the operations of the local association. These procedures were established by the Farm Credit Act of 1933.

One general policy is that only farmers are allowed to borrow money from the associations, and the money borrowed is to be used for production purposes.

Each farmer borrowing from the association is also considered a member, but only for the length of time that he is an active borrower. If he should discontinue borrowing from the association, he is placed on an inactive basis after the second year, and he loses his right to vote in the affairs of the association. This policy always keeps the control of the business in the hands of the active borrowers and enables them to make decisions which will more nearly fit their present credit needs, subject to limits set by the Farm Credit Administration and the Production Credit Corporation. These limitations refer mainly to maintaining proper lending ratios and soundness.

A borrower must purchase stock equivalent to 5 percent, or part thereof, of the loan he receives. As an example, if he should borrow $500, he would be required to purchase five shares of stock valued at $25. If he borrows $525 to $600 the borrower must purchase six shares of stock valued at $30. The purpose of this is to have those who use the credit assume a part of the risk involved. This stock is also the voting stock which gives the active borrowers the privilege of directing the operating policies of the association.

When the farmer repays his loan, he has several choices as to how he will handle his stock. He may decide to leave his stock in the association. If so, he will accomplish a three-fold purpose. First, he will be able to borrow again without the purchase of extra stock, as long as he holds stock equal to 5 percent of his intended loan. Secondly, this stock will serve as an investment in his own credit facilities. The board of directors of a local credit cooperative made the following statement, "The purchase of Class A stock by the farmer should be looked upon as just another necessary tool for making a crop—it is just as important as a tractor, combine, or a mule."[2] The farmer, through his investment in stock, will give added financial strength to his local associations and make it possible to carry on sound and better lending operations. Thirdly, if the holder of the stock does not borrow within a two-year period, his stock is converted to Class A, non-voting stock, but will share in any dividends which might be declared. The extent to which dividends have been paid by the 10 associations are as follows: 1934-49 none, in 1950, two associations; 1951, one; and in 1952, four associations. The dividend rates were 5 percent in all of the above cases except one, which paid 3 percent. This means that some of the farmers who have accumulated stock in their organization are receiving cash dividends plus the fact that they are making their association financially stronger. Most managers felt that in a few years dividends would be paid each year, especially in the cooperatives that had been able to build up sufficient reserves.

Another alternative is that the farmer may request that his stock be sold at the time of the repayment of his loan. Since the associations are generally making loans continuously, they are able to sell the stock to another borrower and pay the farmer either immediately or very soon after he pays his debt in full. The stock is always handled at par value; the price does not exceed $5 per share when transacted or sold.

In recent years members have increased their holdings of Class A stock. In 1946, Class A holdings averaged $12,000 per association; by 1952, the average was $76,000.

A more recent practice is to pay a patronage refund in cash or to issue Class A stock in the favorable years of operation. Two associations have paid cash refunds—one in the year 1950, and the other for both 1951 and 1952. This practice will probably become common to other associations unless unfavorable economic conditions should arise.

Another similarity of operation is in the method of obtaining funds for lending operations. The following procedures are usually followed:

1. The farmers make applications for loans either at the branch office or at the main office of their respective local association.
2. The local association either makes or declines the loan. If made, proceeds are disbursed by the association immediately, or as required, without regard to the further handling of the loan.
3. Along with the loan applications, chattel mortgages are taken from the borrowers, and submitted to the Federal Intermediate Credit Bank.
4. After approval of the loans, the mortgages are pooled together and debenture bonds issued. The bonds are backed by the chattel mortgages.
5. The bonds are then placed on the market and are sold to the investing public.
6. The money is sent back to the associations to replace the funds theretofore advanced to the farmer.

The same policy is used in establishing the interest rate charged the borrower. The interest rate is determined by the investment market. For example, if bonds sell for 3 percent, the Federal Intermediate Credit Bank would add a small amount to cover cost of operations. Then the local associations are permitted to add an extra 3 percent, but not to exceed 4 percent, unless a higher rate is prescribed by the Production Credit Corporation with the approval of the Production Credit Commissioner. This would make the interest charge equal to about 5.75 to 6 percent. If a local association adds less than 3 percent spread, it must obtain the approval of the Production Credit Corporation. All associations except three now charge 5.75 percent interest. The three have raised the rate to 6 percent, and it is most likely that the other organizations will raise their rates since it has been necessary to offer higher interest in order to sell the debenture bonds.

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[2] "Annual Report of Board of Directors, 1952," Brookhaven Production Credit Association.

Over a period of years a 3 percent spread has been more than adequate to meet the expenses of the local associations so that substantial reserves have accumulated. At the present time these reserve account for a little over $3 million, or about 50 percent of the total assets.

Methods of approving and granting loans are comparable among the associations. In each association an executive or a loan committee, either approves or declines the loan application. The loan committee is composed of two board members, who are farmers, and the secretary-treasurer. This arrangement appears to be satisfactory, since it provides a committee with a good knowledge of the local agricultural situation.

In addition to the above characteristics all of the associations have the supervisory services of the Production Credit Corporation and the auditing service of the examining division of the Washington office. Some of the benefits of this supervisory service are as follows:

1. Each association has regular audits twice a year. The representatives of the Production Credit Corporation and the examining division of the Washington office audit the local associations.

2. Through the aid of the Production Credit Corporation all loan and application forms have been standardized, thus, facilitating processing loans through the local associations and the Federal Intermediate Credit Bank.

3. A comparable accounting procedure has been developed by the Production Credit Corporation which aids in making comparisons among various associations.

4. The Production Credit Corporation acts as an agent for the local associations in purchasing forms and other office supplies. Bulk orders reduce prices

5. Perhaps the most important service, is the credit examination. This includes a review of every outstanding loan of the local association. These loans are classed according to their soundness: Class A loans have only minor weaknesses, Class B loans have moderate weaknesses and require only normal supervision, Class C loans have major weaknesses and require special supervision, and Class D loans have the outstanding balances which are deemed uncollectable in whole or in part. This enables the manager to concentrate on collecting loans in the critical groups.

OPERATING RELATIONSHIPS AMONG THE PRODUCTION CREDIT ASSOCIATION

Number and Volume of Loans

There was a large variation in the number and volume of loans made by the association (Figure 3). During the first year, 1934, over 5,000 loans were made. The trend continued upward reaching a peak of 16,626 in 1949. Since 1949, the number of loans has declined to about 15,000. Some of the personnel interviewed indicated that the number of loans would possibly decrease further, since many small farmers who had previously been borrowers were leaving the farm to work in other occupations.

The volume of loans ranged from $3 million in 1934 to a peak of $49 million in 1952. There has been a continuous upward trend in the volume of loans since the organizations began operations. This has been due primarily to the use of more production supplies, increased prices, and increased scale of farm operations.

A more significant comparison in the number and volume of loans is shown in Figure 4. The total number of loans made by the four associations in the Delta was 53,000 for the 19-year period

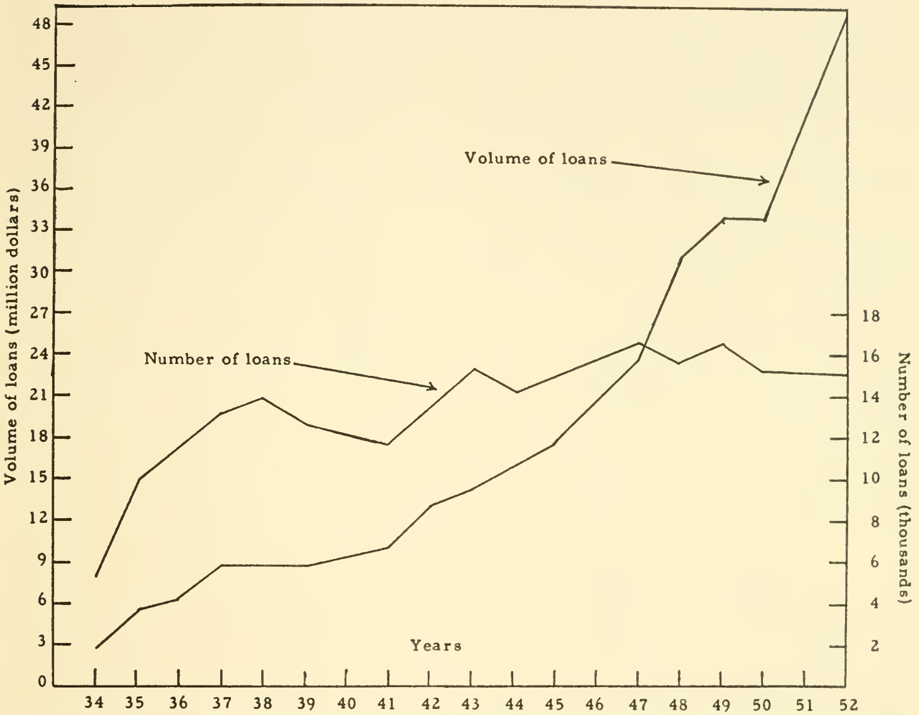

Figure 3. The number and volume of loans made by Production Credit Associations in Mississippi, 1934-1952.

1934-52, as contrasted to 203,000 loans made by the six associations operating in the Upland. The average number of loans per association was 702 in the Delta compared to 1,783 in the Upland. Thus cooperatives in the Upland averaged 2.5 times as many loans per association as did those in the Delta areas for the 19-year period. There were many fluctuations in the number of loans made in the Upland group; whereas, the number of loans made by the Delta group has been rather stable.

The volume of loans was greater for the Delta group every year since the Production Credit system came into existence. For the entire period 1934-52, all of the associations loaned a total of $355 million or an average of $18 million per year. Of the above amount the Delta group loaned $200 million, or a yearly average of $10.5 million, as contrasted to $155 million, or an average of $5.5 million for the group in the Upland area. The volume of loans for both groups has increased each year except for 1950, when the volume of loans dropped for the Delta group (Figure 4).

Volume of loans and size of loans have changed considerably in the last few years (Table 2). The most significant change has been in the size of loans. For the period 1934-44 the average loan was $728, but increased to $1,946—the average size for the period 1944-52. The average loan for the cooperatives in the Upland area was $414 for the period 1934-44 and $1,065 for the period 1944-52. For the Delta group the average loan was $1.921 and $5.309, respectively. In the period 1944-52 the average loan increased by 160 percent for the Upland group and 175 percent for the Delta group above the average for the 10 preceeding years.

The number of loans, however. was only 13 percent greater for the period

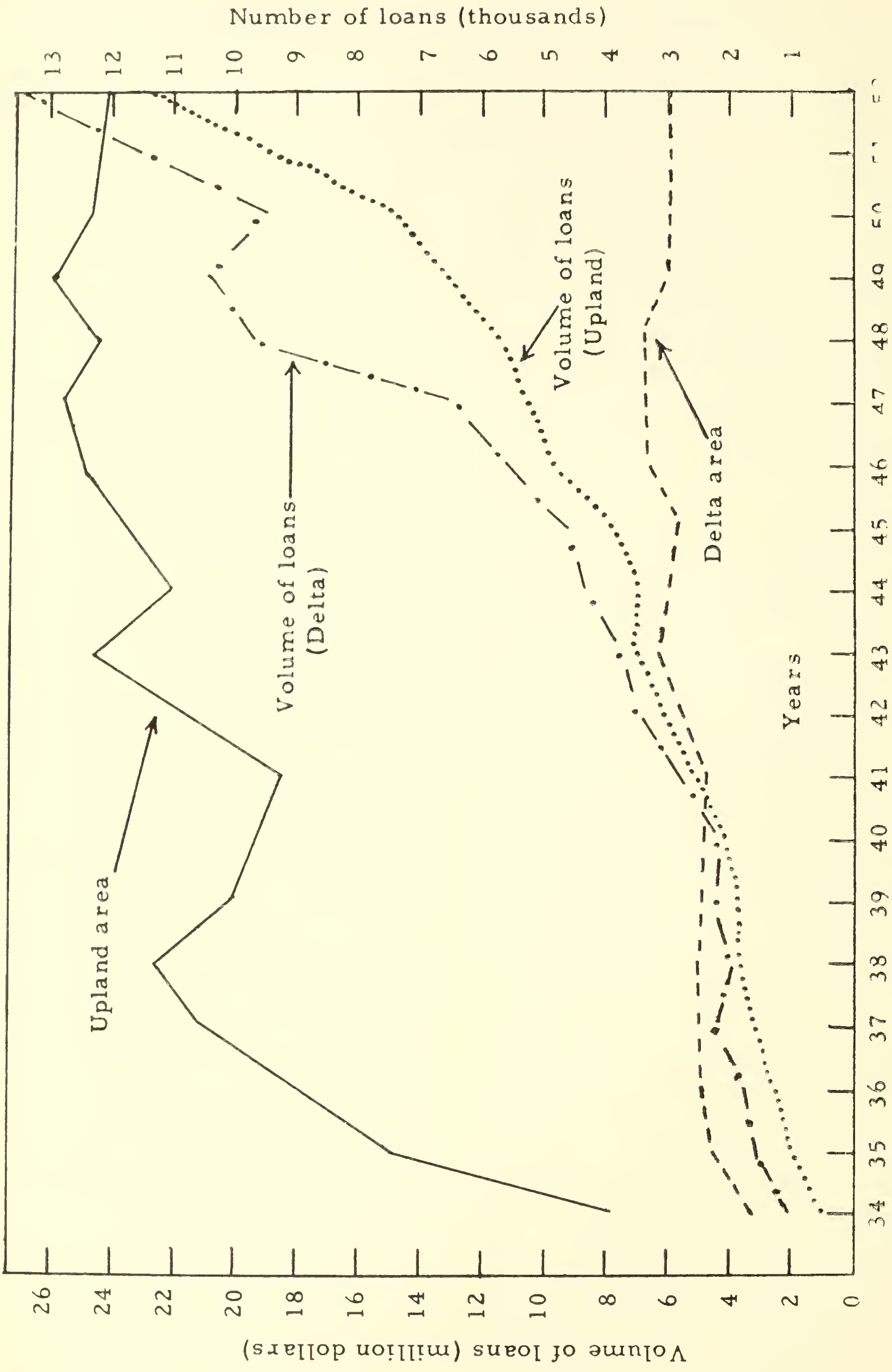

Figure 4. A comparison of number and volume of loans for the Upland and Delta Cooperatives, 1934-1952.

1944-52 for all of the associations combined. There was little difference in the increase in number of loans by the two groups. There was, however, a greater fluctuation in the number of loans made for the Upland group (Figure 4). Although the percentage increase in both number and size of loans was approximately the same for both groups, the actual size of the loans was much greater for the Delta. For the period 1934-44 the average loan for the Delta group was 4.6 times larger than for the Upland group, and was five times larger in the period 1944-52. During the three-year period 1950-52, the average number of loans per association for the Delta group was 743 compared to 2,023 per association for the Upland group. The average volume of loans per association for the same period was $5.8 and $3.1 million, respectively. The Delta group accounted for only 21 percent of the total number of loans made, 1950-52, but accounted for 54 percent of the total volume of money loaned.

Over the past three years the number of loans has remained fairly constant. The volume of loans made, however, fluctuated rather widely (Table 3). Four of the associations made less than 1,000 loans per year with an average of 743 per association, and an average volume of $5.8 million per year for the three-year period. The second group made an average of 1,554 loans with an average volume of $2.6 million per association. The last group made an average of 2,491 loans with an average volume of $3.6 million per association. The average size of the loans was $7,806 for the first group, $1,673 for the second group, and $1,452 for the third group.

The above comparison indicates that the associations making the smallest number of loans were making the largest loans, and those making the largest number made the smallest loans. This is due to the type of farming area since the Upland area has many small farms as contrasted to the large farms in the Delta. It further reveals that the number of loans has remained at about 15,000 per year for the entire group, but that the volume of loans was 1.5 times larger in 1952 than it was in 1950. This indicates that the trend is toward larger loans and possibly a leveling off in the total number at about 15,000.

Loans and Personnel

There was some relationship between the number of loans made and the number of full-time equivalent personnel (Table 4). The associations making less than 1,000 loans per association had an average of seven full-time equivalent personnel employed with an average of 106 loans per person. The associations in the range of 1,000 to 1,999 had an average of 14 people employed and made 111 loans per person. For those making 2,000 loans or more, an average of 17 people were employed, and made 146 loans per person. This

Table 2. A comparison of the number and volume of loans for the Upland and Delta groups for the period, 1934-44 and 1944-52.

Item	Upland group		Delta group	
	1934-44	1944-52	1934-44	1944-52
Total number of loans	94,027	109,326	24,755	28,639
Total volume of loans (000)	$38,940	$116,481	$47,563	$152,052
Average number of loans per year	9,402	12,147	2,476	3,182
Average volume of loans per year (000)	$3,894	$12,942	$4,756	$16,894
Average size of loan	$ 414	$ 1,065	$1,921	$ 5,309

Source: Annual Reports of Production Credit Corporation, New Orleans, Louisiana.

Table 3. The number and volume of loans made in 1950, 1951, and 1952

Number of loans per association	Number of associations	1950		1951		1952	
		No. of loans	Volume of loans (000)	No. of loans	Volume of loans (000)	No. of loans	Volume of loans (000)
Less than 1,000	4	2,974	$18,868	2,924	$23,919	3,020	$27,026
1,000 - 1,999	3	4,673	6,285	4,600	7,784	4,717	9,680
2,000 and more	3	7,610	8,365	7,489	11,054	7,321	12,992
Total	10	15,257	33,518	15,013	42,757	15,058	49,698
Average	—	1,525	3,352	1,501	4,276	1,503	4,970

indicates that as the number of loans increased the number of personnel required increased, but at a decreasing rate.

The volume of money loaned and the number of persons employed showed a much wider variation than in the comparison of number of loans and persons employed. Volume also varied inversely with persons employed. In the first group, $965,000 was loaned per employee. This compares with $230,000 and $244,000 per employee for the second and third groups. It should also be noted that the associations having the highest volume of loans per employee were in the Delta. Farms there are large and capital requirements are higher, therefore, it would be expected that the volume of loans would be greater per employee.

Volume Loaned and Expenses

The volume of loans and the operating expenses increased and bore a close relation to each other (Figure 5). In 1940, total operating expenses accounted for 2.4 percent of the total volume loaned, or 2.4 cents per dollar loaned. In 1952, operating expenses accounted for only 1.2 percent, or 1.2 cents per dollar loaned. This indicates that over the period of years, as the volume of loans has increased, expenses have decreased, when compared on the basis of dollars loaned. It further indicates that the associations have utilized personnel more efficiently, since these requirements have not increased as rapidly as the volume loaned increased, but are affected more by the actual number of loans made.

There were wide variations in the volume of money loaned and the operating expenses among the various cooperatives (Table 5). The associations making less than 1,000 loans per association loaned $106 for each dollar spent for operating expenses. The second group loaned $43 for each dollar incurred in operating expenses. The third group loaned $46 for each dollar of operating expenses. Again, it is evident that, as the volume of loans increased, the expenses per dollar loaned decreased. This indicates that it has been almost as expensive to loan small volumes as it has been to loan large volumes. It further emphasizes the fact that the requirements for personnel and operating expenses have been tied more closely to the number of loans than to volume. It also indicates that, as the associations expanded the volume of loans, they were able to operate more efficiently and lower the cost to the borrowers.

Salaries and Loans

For the associations making less than 1,000 loans per association, the expenditure for salaries for office personnel and field men was $25,000. As the number of loans increased up to 2,000, the expenditure for salaries was $35,000. The association making 2,000 or more loans had a salary expense of $43,000 on an annual basis.

The volume of loans showed a more pronounced relationship to salaries

Table 4. A comparison of number and volume of loans and the number of full-time equivalent personnel, 1950-1952.

Range	Number of associations	Total number employed	Average number employed	Total loans made	Average number of loans	Total volume of loans	Average size of loan
Less than 1,000	4	28	7	3,020	743	27,026	7,806
1,000 - 1,999	3	42	14	4,717	1,554	9,680	1,673
2,000 and more	3	52	17	7,321	2,491	12,698	1,452
Total and average	10	122	12	15,058	1,503	49,698	3,300

Table 5. The annual average volume of loans and operating expenses, 1950-52.

Number of loans Range	Number of associations	Volume loaned	Operating expenses
Less than 1,000	4	$23,271,000	$224,666
1,000 - 1,999	3	7,883,037	185,000
2,000 and more	3	10,803,580	234,000
Total	10	41,957,617	643,666

than did the number of loans. The volume loaned per dollar expended for salaries was $228, $75 and $84, respectively, for each of the three groups compared previously. The second group was less efficient in this comparison and probably was not using its personnel as efficiently or was paying its personnel more than the other groups. For the group as a whole, one dollar

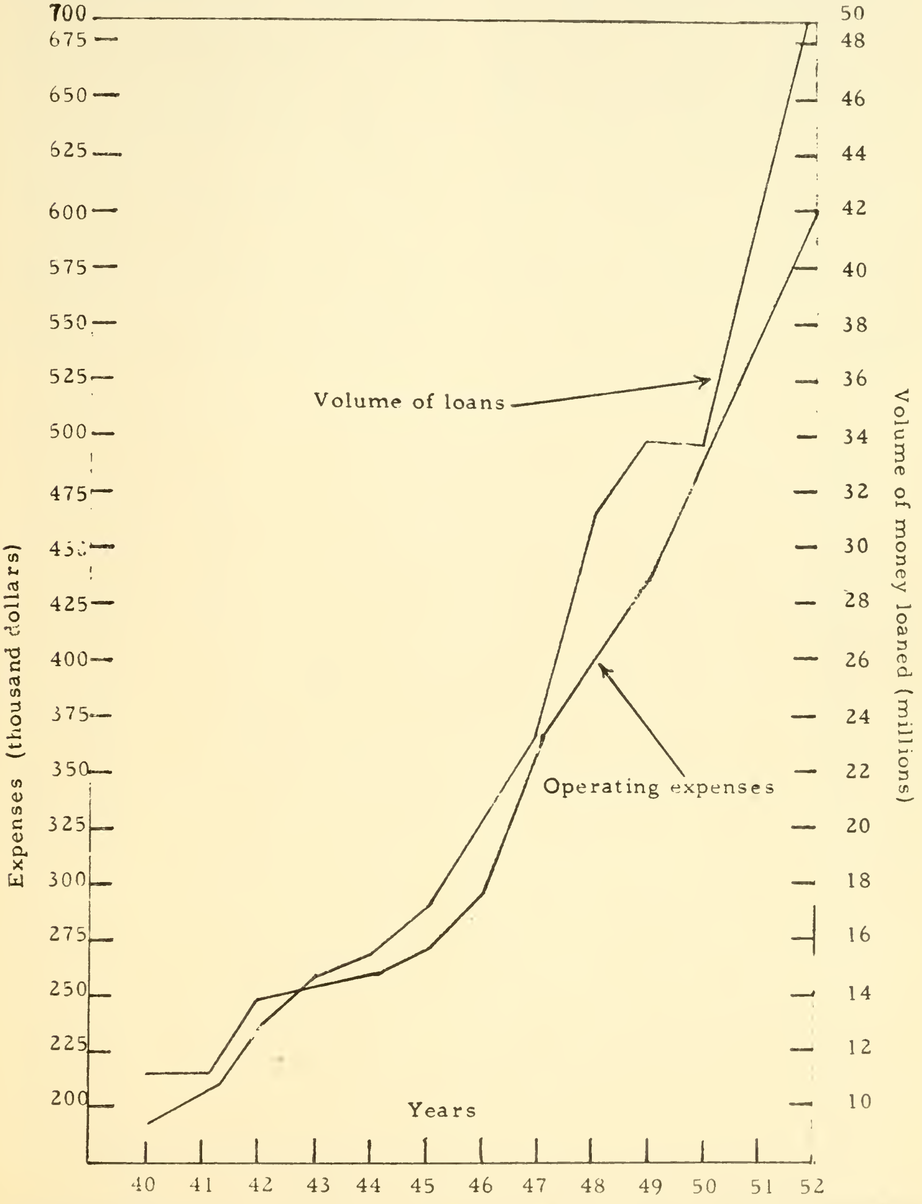

Figure 5. The volume of loans and operating expenses, Production Credit Cooperatives in Mississippi, 1940-1952.

was spent for salaries for every $127 loaned. This comparison indicates higher costs for the associations making large numbers of small loans. It was also noted that, in the Delta, salaries accounted for 46 percent of the operating expenses compared to 54 percent for the Upland. For the group, salaries constituted 51 percent of the total operating expenditure. One of the reasons for the extreme variations above was the difference in the number of branch offices. In the Delta, the associations had an average of two field offices compared to an average of six for the Upland. Some of the difference was accounted for, no doubt, by the larger size of the loans made by the Delta associations.

Loans and Net Earnings

The net earnings of the associations varied from $130,000 in 1940 to $390,000 in 1951. Over a period of years the net earnings have been increasing; whereas, the number of loans have shown a tendency to decline (Figure 6). The net earnings for the years 1949 and 1952 dropped severely at a time when the number of loans were at a peak level. Also, the volume of loans for the above two years was increasing. In checking the other operating procedures of the cooperatives, it was found that several associations retired a substantial amount of the stock held by the Government and also paid patronage refunds and dividends on stock to their members. The above

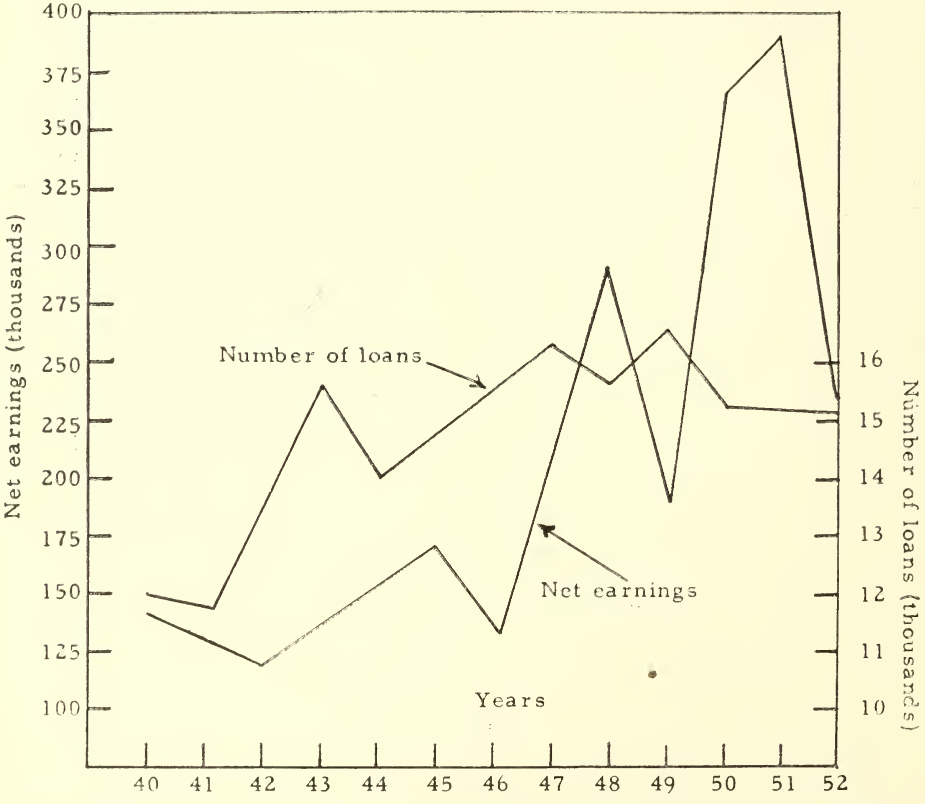

Figure 6. Net earnings and number of loans made by Production Credit Cooperatives in Mississippi, 1940-1952.

practice was probably responsible for the decline in the net margins for the two years indicated.

The associations making the smallest number of loans had the highest net earnings. For example, the cooperatives making less than 1,000 loans had average net earnings of $30,000 per association on an annual basis. The associations making 1,000-1,999 loans had an average of only $11,000 in net margins per association. The cooperatives making 2,000 or more loans had net margins of $17,600 per association. The net earnings ranged from a low of $7,000 to a high of $38,000 based on the average for the period 1940-52. In more recent years the net margins for some of the associations operating in the Delta have exceeded $100,000 per year. For the years 1950-52 the average net margin per association was $34,000.

The volume of loans, however, seemed to have a much more important bearing on the net margins than number of loans (Figure 7). During most of the years, 1940-52, as the volume of loans increased, the net margins increased. The exceptions to this were in the years in which the cooperatives paid patronage dividends and dividends on stock. Government-held stock was invested in bonds, therefore, when these bonds were retired, it necessarily reduced the income of the association. The result was a reduction in the net earnings. Some of the associations had to maintain several branch offices which appeared to be responsible for their lower net margins. The average volume of money loaned annually per

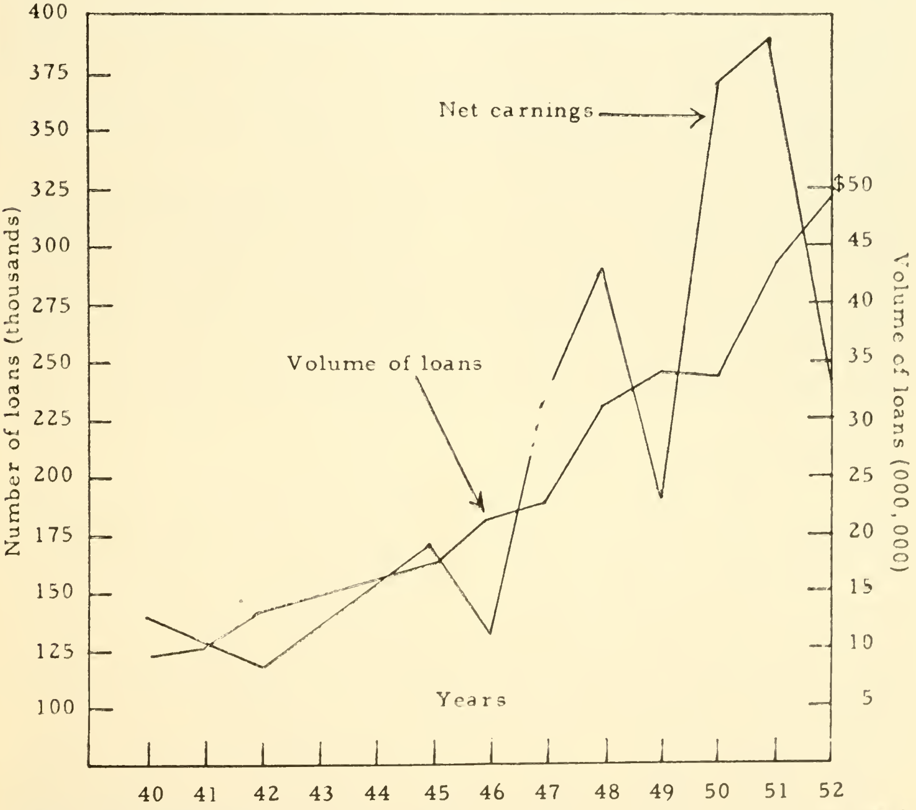

Figure 7. Net earnings and volume of loans made by Production Credit Cooperatives in Mississippi, 1940-1952.

association for the period 1950-52 was $4.2 million on an annual basis. The net earnings averaged $34,000 per association for the same period.

Net Margin Per Dollar Loaned

The net margin per dollar loaned is a fairly good indication of the actual earning efficiency of the association. For the entire group the net margin per dollar loaned was .85 percent for the period 1940-52. During the recent years, 1950-52, the earning efficiency decreased to .70 percent for the group. Individual associations had earning efficiencies ranging from a low of .40 to a high of 1.15 percent per dollar loaned. During the last few years some of the associations have made cash patronage refunds and have paid dividends on stock, these were deducted before net margins were determined. If these were included in the net margins figure, earnings per dollar loaned would be about 1 percent for the group. This indicates that the farmers borrowing through their respective associations were able to have about 1 percent of their total volume of loans to put into the capital structure of their cooperatives as a reserve fund. It has been these earnings, plus the purchase of additional Class A stock, which have made it possible for the organizations to retire almost all of the stock held by the Federal Government and thus become farmer owned and operated.

Length of Loans and Interest Payments

One of the most important considerations from the farmer's point of view is the relationship of the length of time for which money is borrowed and the amount of interest that he must pay. There are several methods of charging interest which are used by various lending institutions. Some of the more common methods of charging interest are as follows:

1. Flat annual rate.
2. Flat annual rate and interest prepaid.
3. Interest charged only on the number of days for which the loan is obtained, with interest prepaid.
4. Interest charged only on the number of days for which the loan is obtained, with interest not prepaid.
5. The budget method in which interest is charged on the actual amount of money borrowed, actual number of days used, and the money is obtained at the time it is needed throughout the period of the loan. This latter method is usually followed by the Production Credit Cooperatives; whereas, one or more of the other methods are more commonly used by other lending institutions.

In order to illustrate the differences in the amount of interest payments under the above methods, the following example of an average Mississippi production loan will be used. Let us assume that Farmer A borrows $2,000 for a period of six months at an interest rate of 6 percent. What will be the cost of the loan under the above mentioned methods.

1. Under the flat annual rate plan a borrower would pay $120, equivalent to an annual interest rate of 12 percent.
2. Under the flat annual rate with interest prepaid the interest payment would be $120. However, the borrower would have the use of only $1,880 since the interest would be deducted from the principal. He would be paying interest at an annual rate of 12.8 percent.
3. Should interest be charged on the number of days used and interest prepaid the payment would be $60. With the interest deducted the borrower would have the use of $1,940; whereas, he would be paying interest on $2,000.
4. If interest is charged on the actual term of the loan with interest not prepaid, the interest payment would be $60, and the borrower would have the full use of the $2,000.
5. On a budget method in which the farmer pays five equal installments, one per month—the interest payment would be calculated as follows:

	Interest
1st, $400 for 6 months at 6%	$12.00
2nd, $400 for 5 months at 6%	10.00
3rd, $400 for 4 months at 6%	8.00
4th, $400 for 3 months at 6%	6.00
5th, $400 for 2 months at 6%	4.00
$2,000 at 6%	$40.00
Service charges	12.50
Interest on money invested in stock	3.00
TOTAL CHARGES	$55.50

Obviously, the interest paid would be in favor of the latter method, which is commonly followed by the Production Credit Associations. It should be mentioned, however, that rates charged by lending institutions differ. For example, as the size of loans increase the rate of interest charged may be lower, and usually the interest rate goes up to 8 percent for small loans. It is, therefore, to the advantage of a borrower to examine carefully the interest payments before obtaining a loan. Another important consideration in respect to the production credit loan is that after all expenses have been paid by the association, any money left over in the form of over-charges belongs to the farmer borrowers. Over a period of years these over-charges have amounted to about 1 percent of the volume loaned. As a result the farmers obtaining money through their credit cooperatives have been able to accumulate an equity in their local associations amounting to over $7 million during the 20-year period of operations.

The actual charges to farmers for money borrowed through the Production Credit Associations are shown in Table 6.

For the associations considered as a whole the interest charges and service fees averaged 3.2 cents per dollar loaned, even though the rate of interest was 5.75 percent. The loans were obtained for an average of 5.5 months with interest charged only for the actual number of days the money was used. The above charges, and income accruing from investments in bonds, have enabled the associations to operate with net earnings amounting to approximately 1 percent of the total volume of money loaned. This means that over the period of years the actual cost of money borrowed through the Production Credit system amounted to about 2.5 cents per dollar.

The charges for making loans by the Delta associations were 2.5 cents compared to 4.0 cents per dollar loaned for the associations in the Upland area. All associations charged a basic rate of 5.75 percent but the Delta loans were five times larger and were made for periods of only one-half as long as were those of Upland cooperatives (4.5 months compared to 9.5 months). This fact is responsible for the difference in the charges and in actual cost to the borrower.

Service fees for loans of different sizes vary and are illustrated below:

Amount of loan	Fee charged
$100 and under	$2.00 to $5.00
101 to $300	3.00 to 5.00
301 to 500	5.00 to 7.50
501 to 1,000	10.00 to 15.00
1,000 and over	$10.00 plus ½ of 1 percent in excess of $1,000 to $15.00 plus ½ of 1 percent of amount in excess of $1,000, with maximum fee of $50.00 to $85.00.

It is evident that as the loans increased in size the fees charged were reduced on a per dollar basis. The fees charged also varied for the different cooperatives. The borrower may, however, use the above table in computing the approximate service fees. Service fees charged per dollar loaned ranged from .25 percent, the lowest, to 1.2 percent, the highest. Since the cooperatives in the Upland area had smaller loans than the Delta cooperatives ($1,500 as compared to $7,000) the service fees per dollar loaned were much higher for the first group.

Table 6. A comparison of the volume of loans, interest payments and service fees, cost of loans, and length of loans for the credit cooperatives, 1950-52.

Number of loans Range	Volume of loans (000)	Interest charged (000)	Service charges (000)	Total charges (000)	Cost per $ (cents)	Length of loans (months)
Less than 1,000	$69,813	$1,582	$174	$1,756	2.5	4.7
1,000 - 1,999	23,749	656	185	841	3.5	5.8
2,000 and more	32,411	1,107	275	1,382	4.3	7.1
Total	125,973	3,345	634	3,979	3.2	5.5

Other Relationships

Recently the Mississippi Livestock and Poultry Loan Law was passed. It has provisions making it possible for farmers to borrow money from banks or other lending agencies for a maximum interest rate of 5 percent, with 1 percent of this to be returned to the State. The funds returned to the State are put into a revolving fund to be used as the need arises in future periods.

It was anticipated by some people that the Production Credit Associations would participate in these lending operations. Since the Production Credit Associations have loaned money at 5.75 percent interest and have had only about 1 percent net profit, it would be difficult to enter the program as set up under the present law. The requirement of paying into the revolving fund plan 1 percent would leave the associations without any funds for building up their capital reserves. Actually several of the cooperatives have less than 1 percent net margins on operations and thus would be unable to enter into the Livestock Lending Program under the present administrative structure. However, Production Credit Cooperatives are making quite a large number of dairy and livestock loans. Loans that have not been repaid at the end of one year are refinanced, if conditions warrant. It was also pointed out that granting only a 12-month loan tended to keep both the lender and borrower aware of the status of the loan and that needed adjustments could be made.

In recent years the Production Credit Cooperatives have offered an additional service to borrowers. This is a credit life insurance program offered at cost to the individual borrower if he desires insurance protection. When a farmer borrows, he may elect to take out a term life insurance policy for the amount of the loan. This one-year policy is obtainable without physical examination or age limit, and has a maximum value of $10,000. In case of death of the borrower, the insurance pays the full face value of the loan. Several companies are offering this type of policy through the local credit associations. However, it is not a requirement for a production loan.

MANAGERIAL RELATIONSHIPS OF THE PRODUCTION CREDIT ASSOCIATIONS

It seems desirable to approach the problem of managerial relationship from the following phases: the members and their functions, the directors and their functions, and the manager and his functions.

Membership

Since 1934, when the associations first began with about 100 charter members, membership had grown steadily and reached 20,000 by 1949. Since then, however, the number has declined to about 15,000 member borrowers. This latter figure does not include the inactive members, that is, the ones who have not borrowed through their organization for the past two years and who hold Class A, or non-voting stock. At the end of 1952 there were 8,000 inactive members or Class A stockholders in the ten Production Credit Associations in Mississippi. These stockholders owned, at that time, almost $1 million worth of Class A, non-voting stock. The Class B stockholders, the voting membership, owned $2.5 million at the end of 1952. A more complete picture of the membership composition is presented in Figure 8. The number of members in the Delta area has been rather stable, ranging from 2,000 to 4,000 per year, 1940-52. For the same period the membership in the Upland cooperatives had a larger range, 10,000 to 14,000. The inactive members for the period 1948-52 averaged 1,000 for the Delta group as compared to 6,000 for the Upland group. The recent decline in the number of active borrowers is probably accounted for by favorable economic conditions of the past several years, and the fact that many of the small farmers, previously obtaining loans, have now discontinued farming. The latter reason is most likely the more important one.

Active members control the organization since they are the only ones allowed to vote. The only way inactive members share in the operation is when and if the associations declare a dividend on the Class A stock. In 1952, six associations declared dividends on stock; prior to 1952 only two associations had declared dividends or had made patronage refunds. However, it is likely that most of the associations will declare dividends in future years, since they have liquidated their obligations to the Federal Government and have built up their reserve funds.

An inactive member may transfer his Class A stock to Class B stock and use this for the requirement for borrowing. He must, however, have 5 percent of his total loan in Class B stock. Farmers who have invested in Class A stock have accomplished a three-fold purpose. They share in any dividends that may be declared, they may convert the Class A to Class B stock for borrowing purposes, and they build up the capital structure of their own organization. Since the borrowing capacity of a Production Credit Association is based upon its financial status, the farmers, through the purchase of Class A stock, are insuring and contributing toward the successful operation of their own credit facilities. Every farmer should keep this in mind when he considers selling his stock.

The composition of the membership of the organization ranged from 80 percent landowners and 20 percent renters and share croppers to 50 percent landowners and 50 percent share croppers. The average for the groups as a whole was 70 percent landowners and 30 percent renters and share croppers. In the Upland 75 percent of the borrowers were landowners; whereas, in the Delta only 63 percent of the borrowers were landowners.

The average attendance of the members at the annual meetings, 1940-52, ranged from 18 to 48 percent for the Delta group, and from 10 to 26 percent for the Upland group (Figure 9). During the last few years the attendance of members at their annual meetings has

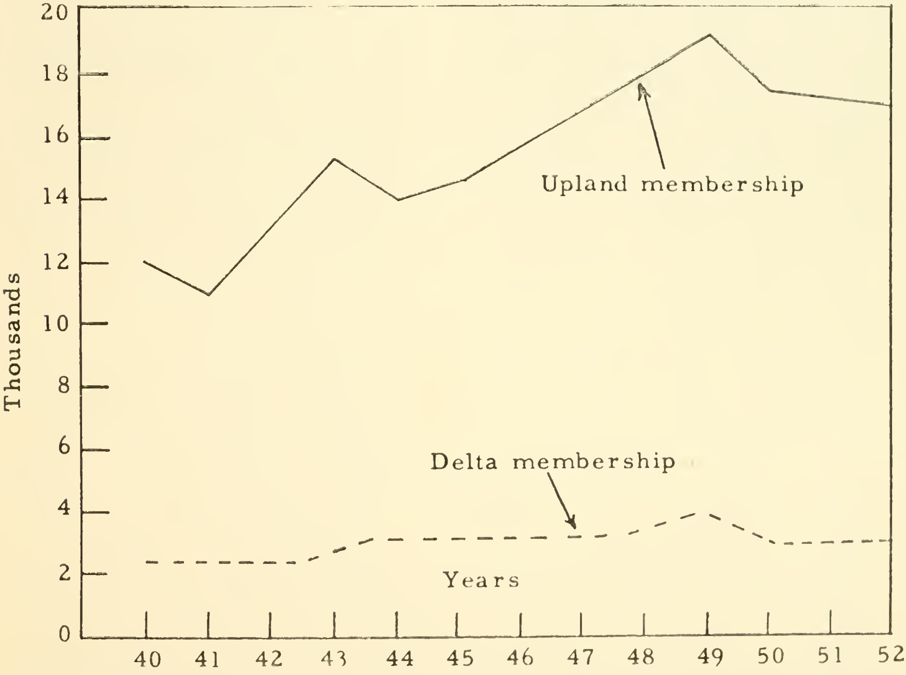

Figure 8. Membership numbers for the Production Credit Associations in Mississippi, 1940-1952.

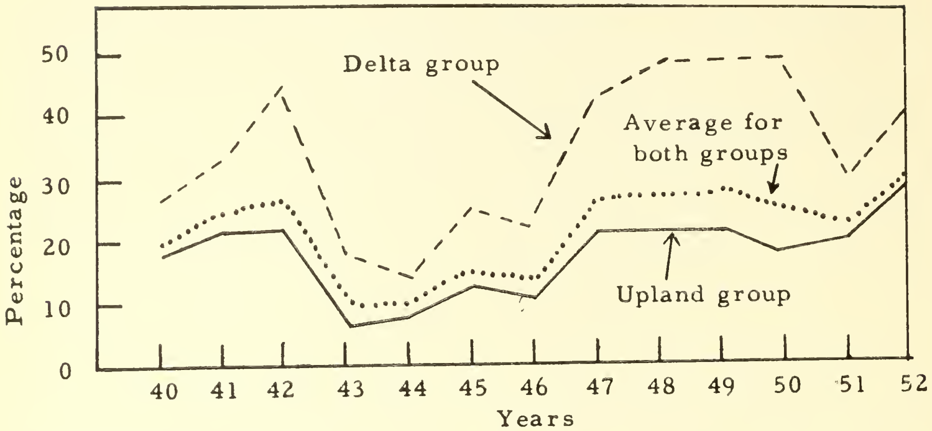

Figure 9. The average membership attendance at the annual meetings of the Production Credit Association, 1940-1952.

increased, with the exception of the Delta group. In 1951 and 1952, the attendance declined from the previous high level that existed in the four preceding years. For both groups combined the annual attendance for the past six years has ranged from 26 to 30 percent. This is about 10 percent higher than the membership attendance at annual meetings of the purchasing cooperatives in Mississippi.[3] It was also observed that the membership attendance varied from various years and among associations. Some of the reasons for these variations in attendance were as follows:

1. The geographic area for the Upland cooperatives is much greater than for the Delta associations, therefore, distance of travel and convenience would favor the Delta group.
2. The size of membership associated with the geographic area influenced membership attendance. The associations with the smaller membership usually had higher percentage attendance.
3. The planning of annual meetings was also closely associated with the attendance at the annual meetings. For example, the associations with some of the following practices had better attendance at their meetings:

a. Well planned meeting on the part of the manager.
b. Presentation of financial statements and other pertinent facts by using charts and other visual aids.
c. Securing outside speakers to discuss topics of major interest to the members.
d. Soliciting the aid of county agents, vocational agricultural teachers and other farm leaders in organizing programs.
e. Having barbecues, giving prizes, and other similar activities.
f. Contacting school bus drivers and arranging to have them bring in people to the meeting.
g. Providing some type of entertainment such as singing, comedy skits, etc.
h. Appointing local committees in various areas so that these committee members could aid in contacting and informing members about the meeting to be held.
i. Sending out pamphlets and program schedules to the members prior to the meeting.
j. Announcements through the local papers and radio stations.

It was reported by managers and by others closely associated with the organizations that a well planned program incorporating the above features would result in a good attendance at the annual meetings. It was also indicated that the annual meetings were of major importance since it was a means of getting members to feel their responsibility toward their organization.

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[3] Jenkins, Lewis P., "The Operating Policies and Practices of Cooperative Purchasing Association in Mississippi," Mississippi Agricultural Experiment Station Bulletin No. 491, June, 1952.

The membership turnover was fairly high for several of the associations. For the three-year period, 1950-52, an average of 2,700 members, or 16 percent of the total membership left the associations each year. For the same period, however, new members were almost sufficient to offset these losses and the total membership dropped slightly.

The members were usually informed about the operations of their cooperative association in the following manner: by being given condensed copies of the annual operating statements; by the presentation of information at the annual meetings by the manager and directors; by visiting speakers giving discussions on pertinent topics relative to credit at the annual meetings; by the showing of motion pictures related to production credit; by sending information pamphlets through the mail; by the purchasing of calves for 4-H Club members, thus training the young farmers in the use of credit; and by the various field men operating the branch offices. A further discussion will be given concerning the activities of the managers and their personnel in another section of this report.

One of the difficulties of informing members, as indicated by some of the managers, was that it was hard to get a convenient and suitable meeting place large enough to accommodate all of the members. This was particularly true for the associations in the Upland which covered several counties (Figure 2). It might be more desirable to have several meetings in order to overcome the above problem. Meetings might be held on a county basis or in each area where there is a local branch office. This would make the meetings more accessible to the farmers; and in the long run, getting the people to understand the credit system and to use it will determine its success or failure.

Directors

In each association there are five directors who determine the policies. As has already been mentioned, two are elected by the board as a whole to serve on the Loan Committee with the secretary-treasurer. This Committee has full authority to approve or to decline loan applications.

The directors are elected for three years. The practice followed is to elect two directors one year, two the next, and one the next year. This procedure removes the danger of having a completely new set of directors at any time.

It is possible to remove the directors either by a majority vote of the members or by action of the Production Credit Corporation. However, it was indicated that neither of the above practices had been used. In fact, many of the original directors are still serving on the board.

The directors met on the average about six times per year with an average attendance of 95 percent at each of the meetings. Most of the associations followed the practice of paying the directors an honorary fee of $10 per meeting plus $.07 per mile for travel expenses to and from meetings.

The Loan Committee met much more frequently than did the directors. This Committee is subject to call at any time, and it was indicated that during the rush season for lending, the Loan Committee sometimes met more often than once per week. Directors on this Committee, like the directors in general, were paid on a per-meeting basis. It is the duty and responsibility of the Loan Committee to review and pass upon the loan applications of prospective member-borrowers.

It was reported by the managers interviewed that the directors were very active in matters pertaining to the operation of the associations. They also indicated that the directors were punctual at the meetings, and portrayed a strong interest in their organization.

Managers

The office managerial personnel for the association is composed of a secretary-treasurer, assistant secretary-treasurer, clerks and branch office field men and their clerks. The secretary-treasurer is in complete charge of general operations, under the direction of the board. He is responsible for employing or discharging persons mentioned above. He carries out the policies set forth by the board and serves as a member of the Executive or Loan Committee.

On the whole the managers have been very stable. Six of the associations have managers who have been with them since they started in 1934. The remaining associations, except one, had managers who had been with them at least 17 years.

The managers were also well trained in both formal education and experience. Their education ranged from high school and 24 years of experience to four years of college and 18 years of experience. There seemed to be some indication that formal education and experience were substitutes for each other.

There appeared to be no direct relationship between salaries paid managers and their education. A manager with a college degree received the lowest salary of the entire group; whereas, the manager with the highest salary had a high school education. There was a difference of six years' experience in favor of the latter. (The average salary for the entire group was $7,394, 1952.)

Along with the managers each association employed field men or branch office managers. These employees are under the supervision of their respective secretary-treasurer, generally referred to in this report as the manager. The number of field men or branch office managers ranged from one to ten per association. These men were of farm background and in many cases were farming along with their office activities. The main responsibilities of these men are: receiving loan applications, making farm inspections, supervising loans, making loan analysis, and collecting loan payments. By having these field men located strategically throughout the State, farmers have convenient places for making loan applications and also personnel to confer with in regard to their farm plans and loans.

SUMMARY AND CONCLUSIONS

It was evident from a review of the lending agencies and their policies of credit extension together with the depressed economic conditions of the early 1930's, that farmers in general were faced with the problem of obtaining adequate credit for production purposes. In 1933 the Farm Credit Act was approved by Congress. This act made it possible for farmers to organize Cooperative Credit Associations for the purpose of aiding themselves in obtaining needed credit.

The association in Mississippi (ten in number) were organized in 1934 and began lending operations. The Production Credit Corporation invested an average of $287,000 per association, which was used as a reserve fund and which served as a basis for increasing their borrowing capacity through the Federal Intermediate Credit Bank.

Since 1934, all of the Government capital except $55,000 has been retired and presently the Production Credit Associations in Mississippi are largely farmer owned and borrower controlled. They have assets totaling more than $5 million or an average of over a half million dollars per association. The farmers have continually invested in their own organization and, as illustrated in Table 1, have built a soundly financed credit system with a borrowing capacity of over $60 million annually. However, the actual amount borrowed at the peak, August 1952, was $37 million. It is usually recommended that the ratio of borrowing to capital and reserves be about six to one. The maximum ratio is ten to one but this figure is very seldom reached by any of the associations and is not encouraged by the Federal Intermediate Credit Bank, their source of credit.

For the past several years the ten Production Credit Associations in Mississippi have made an average of about 15,000 loans with annual volume exceeding $44 million. During the last few years, the number of loans has declined, which is probably accounted for by the relatively favorable economic conditions that have prevailed, and the fact that many of the small farmers have quit farming. The average size of loan has been about $2,800; however, the associations in the Delta made much larger than average-size loans. The associations making the largest number of loans also made the smallest average-size loans. This appeared to be the result of the type-of-farming areas, particularly those with the small-size farms.

The associations employed an average of 12 full-time equivalent personnel, ranging from 5 to 20. Usually those making the largest number of loans had the highest number per employee.

The average net margin for the associations for the four years, 1949-52, was about 1 percent of the total volume of money loaned. The average length of loans was 5.5 months, 1950-52. Interest payments plus loan service fees amounted to 3.2 cents per dollar loaned. Since margins of 1 percent were realized, this means that the long-run cost of credit to farmer borrowers was about 2.5 cents per dollar borrowed, based on a 5.5 month loan. The reason for this low cost is that the Production Credit Associations charge interest only for the number of days for which the money is used, and also any accumulation of funds over and above the actual cost belongs to the farmer borrowers.

It was evident that the associations in the Delta were able to operate at greater savings to their member borrowers. This was due to the larger average size of loan—five times that for the Upland group. This increased volume of loans made it possible to operate at a lower cost, per dollar loaned.

The members have continually invested in their organizations and the associations have retired all except $55,000 of the Class A stock owned by the United States. The number of active members, has averaged about 15,000 per year, 1948-1952. The inactive borrower members averaged 7,000 for the same period of time. The active borrowers have the voting rights in the organizations and vote on a one-man one-vote basis. Their attendance at the annual meetings averaged about 45 percent for the Delta and 20 percent for the Upland. Based upon estimates, membership in the Delta associations was composed of 12 percent more renters and share croppers than for the Upland area.

There were five directors in each association. They were elected for a term of three years on a staggered system. This system appears to be sound, eliminating the danger of having a completely new board at any one time. Over a period of years, it was indicated that board members had a relatively low rate of turnover since many of them had been serving for several terms. Two of the directors are appointed to serve on the Loan Committee with the manager. This Committee is charged with the responsibility of approving or declining the loan application; whereas, the board as a whole is responsible for setting the general operating and credit policies of the organization.

The office managerial staff composed of the secretary-treasurer, assistant secretary-treasurer, clerks, and branch office managers and clerks were responsible for carrying on the business operations. The secretary-treasurer, generally referred to as the manager, was in complete supervision, being subject only to the decisions of the board. Managers had very good training, especially from the standpoint of experience. Over half of them had from one to four years of college training. Their experience in related fields exceeded fifteen years for the group as a whole.

The turnover among the managers has been relatively low. Six have been with their respective association since it began operations in 1934. For the group as a whole the average tenure for managers was about 17 years. It was indicated by the managers that other office personnel had been rather stable, which in turn had tended to bring about an efficient organization.

Branch office field men were directly responsible for receiving loan applications, making farm inspections, supervising loans, collecting payments, etc. These men were of farm background and in several cases carried on farming operations along with their own duties. Association managers indicated that a farm background was essential for branch-office personnel.

There were indications that some organizations utilized personnel more efficiently than others, when considering the number employed per loan, salaries per loan, etc. The data, however, were limited and more complete information is needed before definite conclusions can be reached.

Borrowers in the Delta area secured loans averaging $5,000 in size, for an average of 4.7 months, at a cost of 2.5 cents per dollar borrowed, 1944-52. The Upland borrowers had loans averaging $1,000 in size, for an average of 6 months, at a cost of 4 cents per dollar borrowed for the same period. Since most associations had net margins amounting to about 1 percent, the long-run actual cost of money borrowed through the Production Credit Association would be about 1 percent less than the above indicated figures.

In recent years the Production Credit Associations have loaned an average of $44 million to 15,000 farmers each year in Mississippi. Also over the period of years, 1934-1952, the farmer borrowers have been able to accumulate over $6 million in assets and have established a maximum borrowing capacity of over $60 million annually.

Based upon other preceding discussions in this report, it appears that Production Credit Associations have made a very worthwhile contribution toward providing adequate and reasonable credit for production purposes. It also appears that they will, in the future, be able to continue sound and economic lending.

M696
no.514

BULLETIN 514 MARCH, 1954

Broiler Production, Financing and Marketing In Mississippi

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ACKNOWLEDGMENTS

This publication reports on a Mississippi phase of the Southern Regional Poultry and Egg Marketing Project SM-6 which was financed in part from Title I 9 (b) 1 and 2 and 9 (b) 3 funds made available under provisions of the Research and Marketing Act of 1946.

The authors are grateful to the broiler producers and the broiler feed dealers of the state for their cooperation in supplying necessary data for this study. Appreciations are also extended to Mr. James E. Hill, Acting Head, Poultry Department, Experiment Station; Mr. Paul Yount, Extension Poultryman, and their staff for suggestions in the development of the study. Gratitude is especially due to Dr. R. J. Saville for his helpful suggestions during the time the study was being conducted and the manuscript prepared.

The authors also benefitted from the suggestions of the Broiler Sub-Committee of the Southern Regional Poultry Marketing Technical Committee, especially Dr. C. K. Laurent and Mr. Homer Blackstone and the members of the Poultry Section of the former Bureau of Agricultural Economics, United States Department of Agriculture, who were consulted on various occasions during the study.

Finally, a word of thanks is extended to Mr. Dewey Pritchard and Mr. Paul Mohn for their most helpful assistance in collecting the field data used in the study.

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Broiler Production and Marketing In Mississippi

By

W. E. CHRISTIAN, JR. and PAUL T. BLAIR

INTRODUCTION

During recent years, commercial broiler production in Mississippi has increased at a phenomenal rate. Relatively high retail prices of beef and pork have probably been reflected in an increased consumer demand for broiler meat. There is evidence to indicate since 1935 consumers have been eating more of other meats as well as chicken, Figure 1. This can be attributed largely to both a shift in demand through income changes and an increase in production. As disposable income increases, consumers tend to eat more meat if it is available. If income were greatly reduced, consumption of chicken would not necessarily decline to its pre-war status.

The rate of expansion of the broiler industry in Mississippi has been greater since 1935 than for the United States. Production in the States has increased from 125 thousand birds in 1935 to about 33 million in 1952, while production for the United States increased from about 43 million in 1935 to about 856 million in 1952.[1] Mississippi's greatest expansion has occurred since 1946, Figure 2.

If marketing is to be performed efficiently, the organization of the institutional marketing system must develop at a rapid rate. Major expansion of production has occurred during a period of a relatively high general price level and general prosperity. Based on general observations and momentum of the movement, new producers may have been induced to enter broiler production without proper consideration being given to the long-run aspects of the industry. As is characteristic of a rapidly expanding industry, old problems have been aggravated and new ones have arisen.

Objectives of Study

The purpose of this study was to: (1) relate marketing practices and financing methods to returns to producers; and (2) evaluate the effects of marketing practices and financing methods on the stability of the broiler industry.

Scope and Method

Seven counties were selected as the area to be covered in this study, Figure 3. They were chosen because they generally constituted the major broiler production areas of the state. Data were collected by personal interview from both broiler feed dealers and broiler producers in each of these counties. The original plans were to secure data from a 100 percent sample of dealers and a 25 percent random sample of producers.

Various reasons prohibited the attainment of a 100 percent sample of feed dealers and field work was concluded with data collected from about 90 percent of them. A total of 220 producer schedules and 52 dealer schedules was taken. However, few of the dealers maintained records sufficient to yield all of the data desired. Many of them discarded what records they kept at the time the account was settled with the producer. More success was achieved with producer schedules, although they were incomplete with respect to production costs and practices.

PRODUCTION CHARACTERISTICS

Certain production characteristics are generally applicable to all of the areas studied. They are related to the general type-of-farming area and the need for a suitable enterprise to supplement farm income and utilize surplus labor.

Characteristics of Production Units

Type-of-farming. The number of acres per farm suitable for row-crop

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[1] "Farm Production. Disposition, Cash Receipts, Income, Chicken and Eggs—1951-52, United States Department of Agriculture, Bureau of Agricultural Economics, April, 1953."

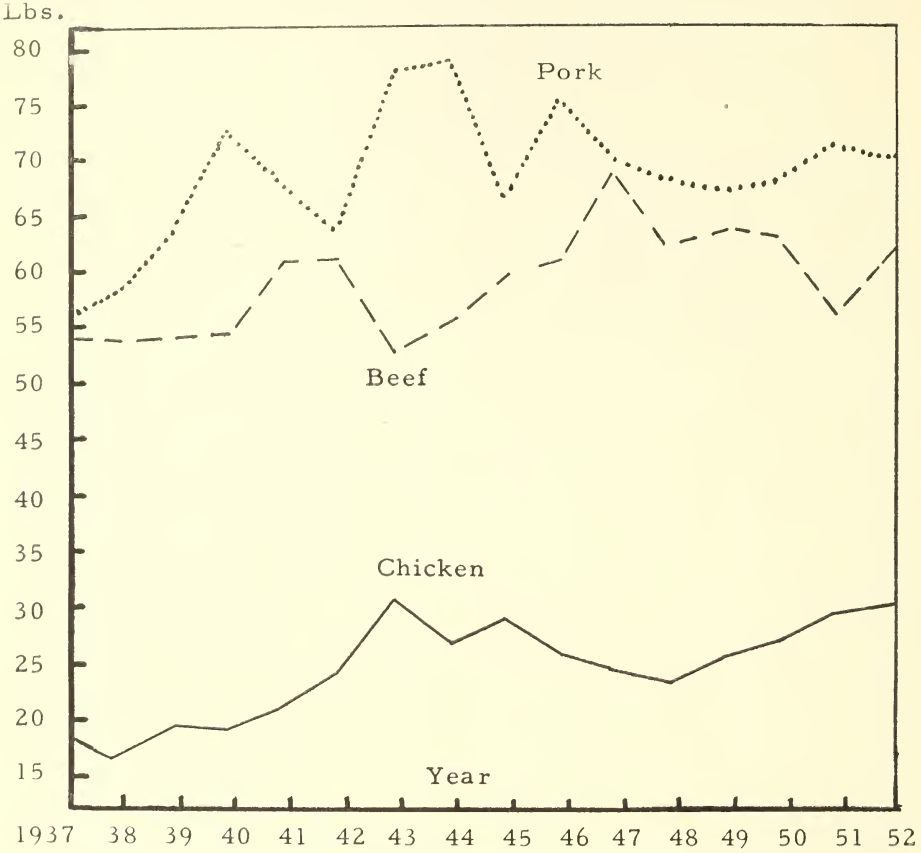
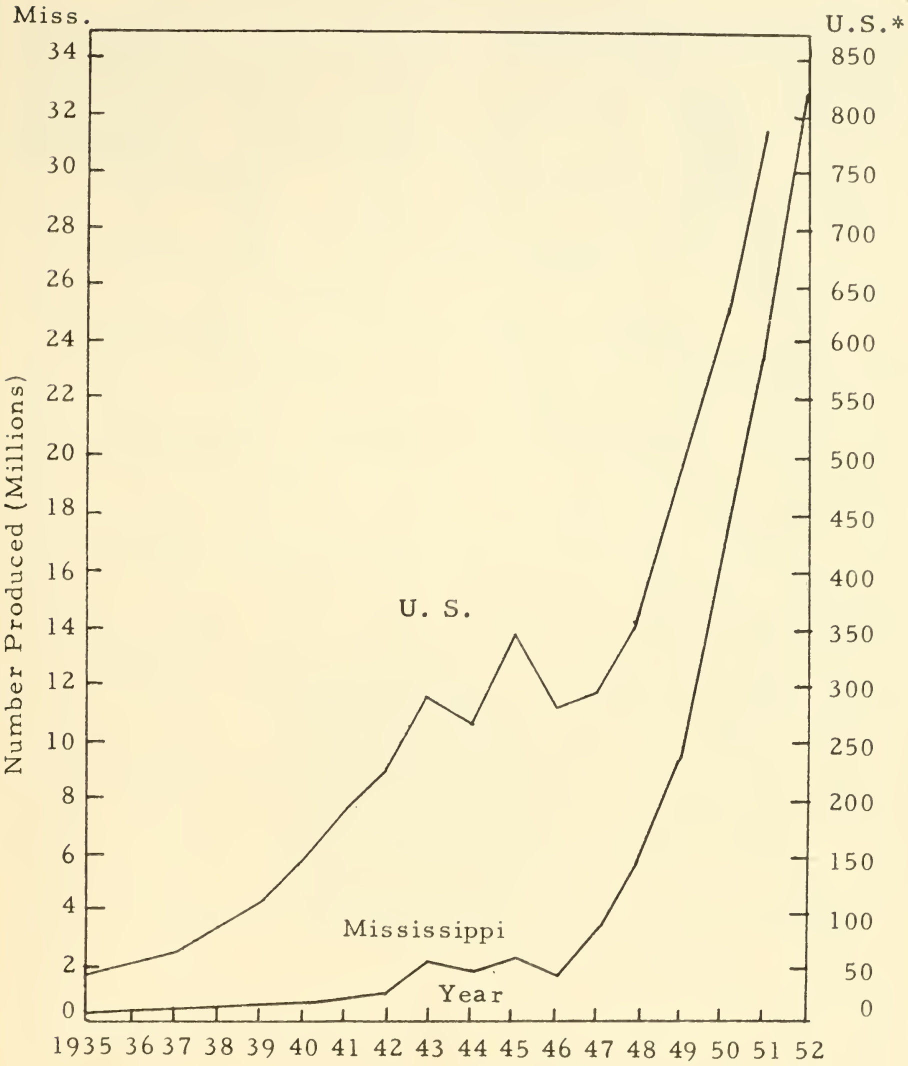


Figure 1. Per-capita consumption of meat, United States, 1935-52.

cultivation tended to be small. The average total acreage per farm is shown in Table 1. For the farms studied in seven counties, the average size ranged from 55 acres in Pike County to 111 acres in Rankin. For all farms in the study, the average was 85 acres. With the exception of 29 cases, all of the 220 producers interviewed reported they owned their farms.

About 25 percent of the farms reported the use of tractors and tractor equipment, Table 2. The average number of acres cultivated per farm ranged from 11 acres in Pike County to 37 acres in Lee. For all farms in the study, an average of 19 acres per farm was in cultivation, Table 2.

The combination of enterprises tended to be about the same for all farms. In most cases, the producers were engaged in general farming with the principal enterprises consisting of cotton, corn, hay and pasture, truck crops and livestock. Data contained in Table 2 indicate that approximately twice as much acreage, on the average, was used for hay and pasture as was utilized in producing row crops. However, the ratio between average acres cultivated and average acres in hay and pasture varied widely among counties. The ratio was about 1 to 4 for Pike and Rankin Counties; 1 to 2 for Smith, Scott, and Itawamba Counties; 1 to 1 for Simpson County; and 1 to 1.5 for Lee County.



Source: U.S.D.A., Agricultural Statistics, 1935-1951, Washington, D. C., 1935-1951.
U.S.D.A., BAE, Mississippi Farm Report, Agricultural Statisticians' Office, Gulfport, Mississippi, January, 1953.
* 1952 production not available.

Figure 2. Broiler production, United States and Mississippi, 1935-1952.

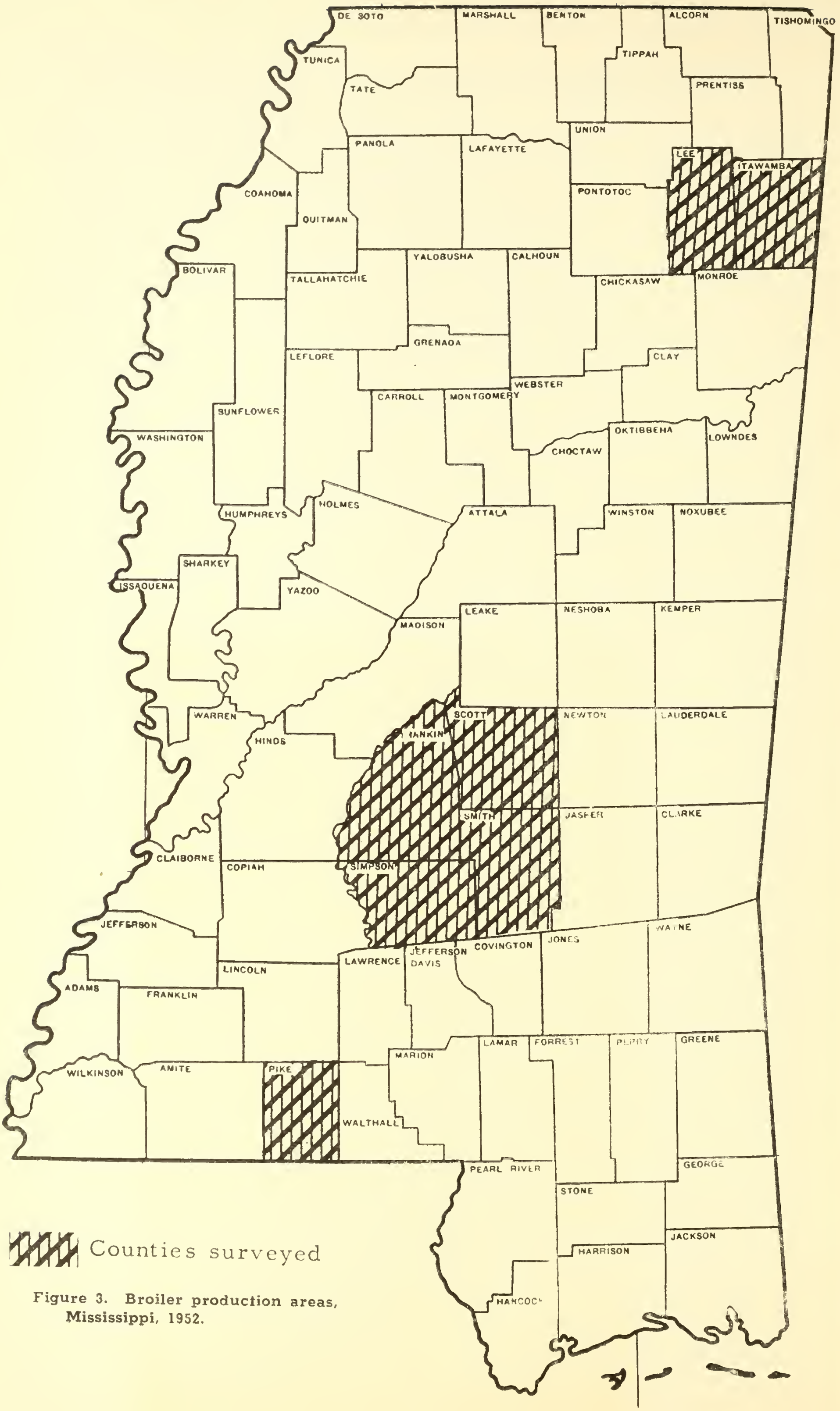

DE SOTO
MARSHALL
BENTON
ALCORN
TISHOMINGO
TUNICA
TIPPAH
TATE
PRENTISS
UNION
PANOLA
LAFAYETTE
LEE
ITAWAMBA
COAHOMA
PONTOTOC
QUITMAN
BOLIVAR
YALOBUSHA
CALHOUN
TALLAHATCHIE
CHICKASAW
MONROE
GRENADA
LEFLORE
CLAY
WEBSTER
CARROLL
MONTGOMERY
SUNFLOWER
WASHINGTON
OKTIBBEHA
LOWNDES
CHOCTAW
HOLMES
HUMPHREYS
ATTALA
WINSTON
NOXUBEE
SHARKEY
ISSAQUENA
YAZOO
LEAKE
NESHOBA
KEMPER
MADISON
WARREN
SCOTT
RANKIN
NEWTON
LAUDERDALE
HINDS
SMITH
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
JEFFERSON
WAYNE
JONES
COVINGTON
JEFFERSON DAVIS
LAWRENCE
LINCOLN
ADAMS
FRANKLIN
LAMAR
FORREST
PERRY
GREENE
MARION
WILKINSON
AMITE
PIKE
WALTHALL
PEARL RIVER
GEORGE
STONE
JACKSON
HARRISON
HANCOCK
▨ Counties surveyed

Figure 3. Broiler production areas, Mississippi, 1952.

Table 1. Average acres in farms operated by 220 broiler producers, compared with the average census farm in 1950 for the seven counties, Mississippi, 1952.

County	Acres per broiler farm	Acres per 1950 census farm
Rankin	110.7	103.6
Smith	94.0	81.4
Itawamba	83.8	82.6
Scott	81.4	72.9
Lee	76.5	51.2
Simpson	75.7	85.5
Pike	55.0	78.3
All counties	85.0	77.1

Table 3. Average broiler capacity per producer and average square feet of floor space utilized per bird, seven counties. Mississippi, 1952.

County	Average capacity (birds)	Average floor space per bird (sq. ft.)
Scott	7,030	.72
Smith	6,910	.68
Rankin	6,143	.66
Pike	4,766	.87
Simpson	4,088	.83
Lee	3,991	.94
Itawamba	3,670	.83
All counties	5,533	.74

Size of broiler units. Small production units were characteristic of the broiler industry in Mississippi. The average size, as measured by the average capacity of broiler houses, is shown in Table 3. Average capacity ranged from 3,670 birds in Itawamba County to 7,030 birds in Scott County. The difference in capacity cannot always be accounted for on the basis of larger single houses in particular counties. For instance, a capacity of 8,000 birds may be derived from four separate houses of 2,000 each or a single house of 8,000 capacity. The small capacity and larger number of houses generally applied in those counties in which producers had been in the business for a long period of time. During recent years there has been a tendency for new broiler houses to be constructed with a larger capacity. The average capacity per producer for the seven counties studied was 5,533 birds.

Floor space per bird. There was a range in the average floor space allowed per bird from .66 sq. ft. in Rankin County to .94 sq. ft. in Lee County, Table 3. The average for all counties studied was .74 sq. ft. per bird. This closely approximated the recommended allowance of .75 sq. ft. generally made by poultry specialists. There was a tendency for a slight seasonal variation since birds need more space during hot weather.

Labor requirements and technical knowledge. As already pointed out, most of the farms on which broilers are produced do not have an appreciable amount of land suited to row crops. Therefore, these farm families frequently are faced with a labor utilization problem. As a result, often the head of the family finds off-farm employment necessary, while other members of the family operate the farm. The broiler enterprise is suited to such a situation, since it is usually possible for women and children to do much of the required labor. Table 4 indicates that labor requirements did not increase in proportion as capacity increased; however, caution must be used in drawing inferences in this case due to the small number of producers with relatively high capacity. It was also noted that one or two of the larger producers utilized automatic feeders, although as a general rule all broiler feeding was done by hand.

For 218 producers, an average of 3.8 hours of labor per day was required. This was based on time required for feeding and other daily chores. Broiler producers were dependent almost entirely on other agencies for hauling the birds to market and for feed de-

Table 2. Selected characteristics of farm operations of 220 broiler producers, seven counties, Mississippi, 1952.

County	Percent reporting tractors	Percent reporting land in cultivation	Average acres in cultivation	Average acres in hay and pasture
Simpson	50	88	27	26
Itawamba	30	88	22	47
Scott	29	89	17	38
Rankin	22	87	13	47
Pike	20	40	11	43
Smith	15	94	17	36
Lee	9	55	37	54
All counties	26	84	19	41

Table 4. Frequency of various ranges of broiler capacity and average labor requirements, 218 producers, Mississippi, 1952.

Capacity (No. birds)	Frequency		Hours of labor required/day (weighted average)
	No. producers	Percent	
0- 2,000	40	18.3	3.2
2,001- 4,000	60	27.5	3.1
4,001- 6,000	51	23.4	3.7
6,001- 8,000	27	12.4	4.4
8,001-10,000	19	8.7	4.5
10,001-12,000	9	4.1	5.4
12,001-14,000	3	1.4	5.0
14,001-16,000	5	2.3	6.0
16,001-20,000	4	1.9	5.2
All classes	218	100	3.8

livery. Birds were sold at the farm and loading crews performed the necessary labor.

In nearly all cases, the feed dealer extended credit for feed, chicks, and supplies and retained title to the broilers during the production period. The credit source usually reserved the right to supervise and regulate some of the management practices and marketing activities. Under these conditions, many of the producers might not have felt the necessity of acquiring technical knowledge needed to manage efficiently.

Investment. Buildings and equipment do not constitute as large an investment per producer as might be expected. Several factors account for this condition. Many producers have had access to cheap material for the construction of broiler houses. With the mild climate in Mississippi, houses do not have to meet the more exacting standards prevalent in some areas. In most cases, the land utilized would have little value in alternative uses.

The average value of broiler houses per producer interviewed constituted from 7.2 percent of average total farm assets in Rankin County to 17.2 percent in Scott County, Table 5. For all counties studied, an average of 11.3 percent of total farm assets was represented by broiler houses. Percentages of assets represented by waterers, feeders and brooders were about 1, 2, and 3 percent, respectively. On the average, the broiler enterprise represented about 17 percent of total farm assets.[2] This does not imply a high absolute investment in the broiler enterprise. The average absolute value of broiler houses and equipment per producer, for all counties studied, was about $1,676. Although overhead costs as represented by broiler houses and equipment were relatively low, direct costs which included cost of chicks, feed, and supplies tended to be relatively high. This point will be given subsequent consideration.

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[2] No attempt was made to determine the value of manure derived from the broilers.

Table 5. Composition of farm assets, 220 broiler producers, seven counties, Mississippi, 1952.

County	Average total assets (dollars)	Average value				
		Broiler houses (dollars)	Brooders (dollars)	Feeders (dollars)	Waterers (dollars)	All other assets (dollars)
Smith	9,120.35	890.00	277.12	226.76	63.58	7,662.89
Scott	10,677.72	1,835.94	319.60	203.88	69.98	8,248.32
Simpson	9,897.27	1,142.60	241.54	222.00	68.08	8,223.05
Rankin	12,194.63	875.30	292.44	185.56	47.17	10,794.16
Pike	10,128.21	858.20	328.64	240.17	95.25	8,605.95
Lee	14,525.14	1,786.11	362.50	300.67	160.17	11,915.69
Itawamba	9,159.70	973.00	184.44	155.66	45.56	7,801.04
All counties	10,110.10	1,141.69	268.53	201.20	64.56	8,434.12
		Percent of total farm assets				
Smith		9.8	3.0	2.5	0.7	84.0
Scott		17.2	3.0	1.9	0.7	77.2
Simpson		11.5	2.4	2.2	0.7	83.2
Rankin		7.2	2.4	1.5	0.4	88.5
Pike		8.5	3.2	2.4	0.9	85.0
Lee		12.3	2.5	2.1	1.1	82.0
Itawamba		10.6	2.0	1.7	0.5	85.2
All counties		11.3	2.7	2.0	0.6	83.4

Cost of production. Very few production or financial records were found among producers interviewed. In most cases, the records available consisted of a few sales tickets or summary sheets given the producer by the feed dealer. Feed dealers tended to have somewhat more complete cost data; however, quite frequently the feed dealer made a practice of discarding individual brood records when the brood was sold and settlement made with the producer. In the absence of more complete data, this study was confined to a consideration of direct costs as represented by costs of baby chicks, feed, medicine, fuel, and miscellaneous items from the dealer records, and overhead costs as represented by broiler houses, brooders, feeders, and waterers from the producer records.

Table 6 indicates that for all counties studied, the weighted average total direct cost of producing a pound of broiler on open-account contract was 25.8 cents for the period July 1951-July 1952. The weighted average price received (26.8 cents per pound) was 1 cent per pound more than the cost. This points directly to the importance of keeping variable costs as low as possible. It necessitates extreme care on the part of the producer in selecting a dealer to finance his production. Cost of feed, charge for credit, and the degree of dealer participation in management decisions and marketing must be considered in terms of their effect on the direct cost of production. For instance, it is conceivable that a producer might be very efficient in terms of feed conversion obtained on a brood and yet incur direct expenses to the extent that his margin of return above these expenses would be very small. Under certain conditions, production will continue as long as the returns exceed the direct cost. There may be practical exceptions to this among broiler producers in Mississippi. There are indications that in the short run some producers may start another brood immediately after selling a brood for less than the direct cost of production. There is always hope for better luck with the next brood and a chance to pay off the losses from the previous brood. In other words, the decisions are made on the basis of future expectations of cost-price relations rather than on past results.

Relationship of Financing Agency to Production Unit

The agency financing broiler production in Mississippi usually maintained a close relationship with the producer.

Utilization and function of servicemen. Due to the importance of good management, many feed dealers employed servicemen who checked the broilers for which they were furnishing feed at least once each week. Out of 52 feed dealers interviewed, 13 did their own servicing, 28 employed a total of 39 servicemen, 2 reported that the feed company furnished a serviceman and 9 reported that no serviceman was used. The primary duty of the service-

Table 6. Weighted average variable cost and related data of producing broilers*, seven counties, Mississippi, 1951-52.

Weighted average	Unit	Counties							All counties
		Smith	Scott	Rankin	Simpson	Pike	Itawamba	Lee	
Cost per baby chick	cents	17.7	14.5	17.5	17.1	16.2	15.5	15.9	16.3
Cost of feed	dol./cwt.	6.36	6.19	6.11	6.15	6.00	5.92	6.12	6.17
Lbs. feed required to produce one lb. of live broiler	pounds	3.11	2.95	2.84	3.05	3.37	2.94	2.98	3.00
Size of birds when sold	pounds	2.8	2.8	2.3	—	3.2	2.7	2.6	2.8
Age of birds when sold	weeks	10.6	10.3	11.3	11.0	10.3	10.4	9.6	10.4
Total variable cost	cents/lb.	26.4	24.8	25.3	26.7	28.1	24.5	25.9	25.8
Price received per pound July, 1951-July, 1952	cents	27.0	25.0	28.4	27.0	26.4	27.1	25.7	26.8

*Includes only broilers produced on open account contract.

men was to check production practices; however, some of them were utilized for other duties, Table 7.

Production supervision. There is a high degree of risk involved in financing broiler production. As a result, it was not surprising to find that the financing agency was greatly concerned with production practices. In most cases, the producer received production credit without offering security other than a chattel mortgage on the chickens. Feed dealers tended to maintain a considerable degree of control over production. Servicemen employed by the dealers were in a position to render a valuable service to the growers, who were usually not so well informed regarding disease control and recommended production practices. There may be instances where the dealers or servicemen take advantage of their position in a way that may be detrimental to the interests of the producer. In general, however, producers seemed to be well pleased with the services rendered by the dealers and their servicemen.

As would be expected, feed dealers placed a great amount of emphasis on sanitary measures designed to keep losses from diseases at a minimum. In some cases, they also required the disposal of all other farm poultry before they placed broiler chicks with the producer. Many producers, due to limited technical knowledge, under-estimated the importance of disease prevention and control. In general, feed dealers were dependent to a large degree on feed companies for their source of information on feeding and disease control, Table 8. There were some other sources, such as experience and laboratories, which were rather widely used as sources of information.

Table 8. Frequency of source of information on feeding and disease control, 51 feed dealers, Mississippi, 1952.

Source of information	No. dealers
Feed companies	7
Laboratories	5
Experiences	2
Combination of above and all others*	37

*Other mentioned included State College, hatcheries, poultry magazines, text books, and other dealers.

Dealers who furnished feed and supplies on credit also took an intense interest in feeding practices. Out of 220 producers interviewed, 161 reported that the feed dealer made the decision on what type[3] of feed to use; whereas, 14 producers made their own decision and 45 reported that the decision was reached jointly by the producer and feed dealer, Table 9.

Dealer activity with respect to other production decisions did not reach the proportions that it did in the feeding practices. Of the producers interview-

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[3] There are 2 primary types of feed, starter and finisher. Starting feed usually contains 2 to 3 percent more protein than finishing feed and is, therefore, priced somewhat higher

Table 7. Utilization and functions of servicemen, 52 broiler feed dealers, seven counties, Mississippi, 1952.

	Counties							
Item	Smith	Scott	Rankin	Pike	Simpson	Itawamba	Lee	All counties
Dealers interviewed	7	10	4	10	6	6	9	52
Servicemen employed	5	13	2	7	5	2	5	39
Dealer does own servicing	3	2	1	1	2	1	3	13
Feed company furnished serviceman	1	—	—	1	—	—	—	2
Dealers reporting no serviceman	—	1	1	2	1	3	1	9
Function of servicemen:								
Check production* practices	5	3	1	4	5	2	4	24
Check production practices plus hauling feed, placing chicks	2	6	2	1	2	—	3	16
Haul feed and broilers	—	—	—	2	—	1	—	3

*Includes dealers who do own servicing.

Table 9. Source of various production decisions, 220 broiler producers, Mississippi, 1952.

Management decision	Source of decision			Total cases
	Dealer	Producer	Dealer and producer jointly	
	Number			
Type of feed to use	161	45	14	220
When to start brood	38	130	52	220
How many chicks to start	48	146	26	220
What breed or strain to grow	126	67	25	218*

*Two producers did not report on this item.

ed, 126 reported that the dealer decided what breed or strain would be grown, 48 indicated that the dealer decided how many chicks they should start, and 38 said the dealer decided when to start the brood, Table 9.

MARKETING

Broiler production is concentrated in relatively small areas. Broilers are similar to perishable farm products, such as fresh vegetables, in that they must be sold within a relatively short period after they reach the market stage. This necessitates ready outlets. Current information and adequate contacts are essential to the efficient disposal of marketable birds. The discussion of the marketing function will involve consideration of both the outlets and marketing decision.

Market Outlets

The consideration of market outlets in this study was confined to first buyers. No attempt was made to study retail outlets for either live or processed birds. With the exception of broilers moved out of the state by trucker-buyers, it was apparent that local processing plants constituted the primary market for live broilers in Mississippi.

Availability and degree of utilization of alternative outlets. This study revealed that some of Mississippi's live broilers went to at least 11 cities or towns in the state and to 5 cities in 3 adjoining states. No estimate of the number of buyers in each city or town was obtained. Trucker-buyers moved some Mississippi broilers to markets in New Orleans and Baton Rouge, Louisiana, and in Birmingham, Alabama.

The degree to which alternative markets were utilized in the areas studied is shown in Table 10. A total of 78 percent of the weight of broilers sold by 47 dealers went to 4 Mississippi markets (Jackson, Pelahatchie, Morton, and Tupelo). Processing plants located in the vicinity of the production areas constituted the local markets.

Relationship of potential outlets to characteristics of broilers produced. Broiler markets in Mississippi were relatively uniform with respect to the size of bird purchased. However, it was noted that the New Orleans and Baton Rouge market purchased a slightly heavier bird than the Mississippi markets. The average weight per bird marketed from Pike County was 3.2 pounds; whereas, the average for all counties studied was about 2.8 pounds. A large part of Pike County broilers went to the New Orleans and Baton Rouge markets.

No substantial evidence was observed which might indicate that particular outlets required a higher quality bird than others. This situation probably resulted from the rapid expansion of

Table 10. Degree of utilization of various market outlets by 47 feed dealers, Mississippi, July, 1951-July, 1953.

Market outlet	All counties (Percent)	
Mississippi outlets	32.5	
Morton	17.8	
Pelahatchie	14.8	
Tupelo	12.8	
Jackson	2.5	
McComb	1.5	
Laurel	0.4	
Meridian	0.4	
Greenwood	0.2	
Forest	0.1	
Hattiesburg	—	
Total for all Mississippi outlets		83.0
Out-of-state outlets:		
New Orleans, Louisiana	7.1	
Birmingham, Alabama	5.5	
Baton Rouge, Louisiana	1.9	
Memphis, Tennessee	0.1	
Total for out-of-state outlets		14.6
Outlet unknown		2.4
Total all outlets		100.0

the industry and the relatively strong demand for broilers during recent years. However, it should be pointed out that there were indications of increasing interest, on the part of feed dealers and progressive poultrymen, in producing higher quality birds.

Marketing Decisions

When placing a product on the market, a number of important decisions must be made. Among these are: (1) when to sell, (2) where to sell, and (3) price considerations. With respect to most farm products, the responsibility for these decisions rests with the producer. However, the marketing of broilers deviates considerably from this usual pattern. Title to the broilers is seldom vested solely in the producer and he frequently has little to do with marketing decisions.

When to sell. With respect to size requirements of various outlets, it has previously been stated that the only significant difference noted was that the markets in Louisiana purchased a slightly heavier bird. Mississippi outlets utilized a 2.5 to 3 pound bird; whereas, the Louisiana outlets desired a 3.0 to 3.5 pound bird.

Due to the nature of direct cost in producing broilers, it is seldom possible to increase returns by holding the birds off the market when they are ready to sell. When they have reached the stage where their conversion of feed into meat is declining at a rapid rate, a substantial increase in price received is required to offset the cost of holding them off the market for even a few days. Therefore, deciding when to sell is of major importance. Of the 220 producers interviewed, 102 reported that the feed dealer decided when to sell, 56 indicated that they made their own decision and 62 reported that the decision was made jointly between the dealer and producer, Table 11.[4]

Where to sell. Producers seem to be satisfied with the common practice of letting the dealer decide where to sell. Some dealers had permanent arrangements with certain outlets while others indicated that they sold to whatever outlet offered the highest price. Most of the dealers utilized several different outlets during the period studied. Feed dealers determined where the birds would be sold in 176 of the 220 cases; producers decided in 17 cases; and the decision was made jointly in 27 cases, Table 11.

Price considerations. Of the 220 producers interviewed, 185 reported that the dealer decided what price to accept from among those offered by alternative outlets; 13 indicated that they decided themselves; and 22 said the decision was made jointly, Table 11.

Prices offered by alternative outlets within a particular market area tended to be rather uniform at any given time. Exceptions were noted in a few cases where the dealers had set a minimum of 25 cents per pound that would be paid for birds raised by producers whom they financed. These

Table 11. Distribution of marketing decisions, 220 broiler producers, Mississippi, 1952.

County and source of decision	When to sell	Where to sell	What price to accept
Smith			
Dealer	23	40	41
Producer	13	2	1
Joint	11	5	5
Scott			
Dealer	30	48	47
Producer	8	0	0
Joint	14	4	5
Simpson			
Dealer	7	14	13
Producer	2	0	0
Joint	7	2	3
Rankin			
Dealer	4	16	19
Producer	17	4	1
Joint	2	3	3
Pike			
Dealer	9	15	15
Producer	3	0	0
Joint	3	0	0
Lee			
Dealer	5	8	9
Producer	3	2	2
Joint	3	1	0
Itawamba			
Dealer	24	35	41
Producer	10	9	9
Joint	22	12	6
All counties			
Dealer	102	176	185
Producer	56	17	13
Joint	62	27	22
Total cases	220	220	220

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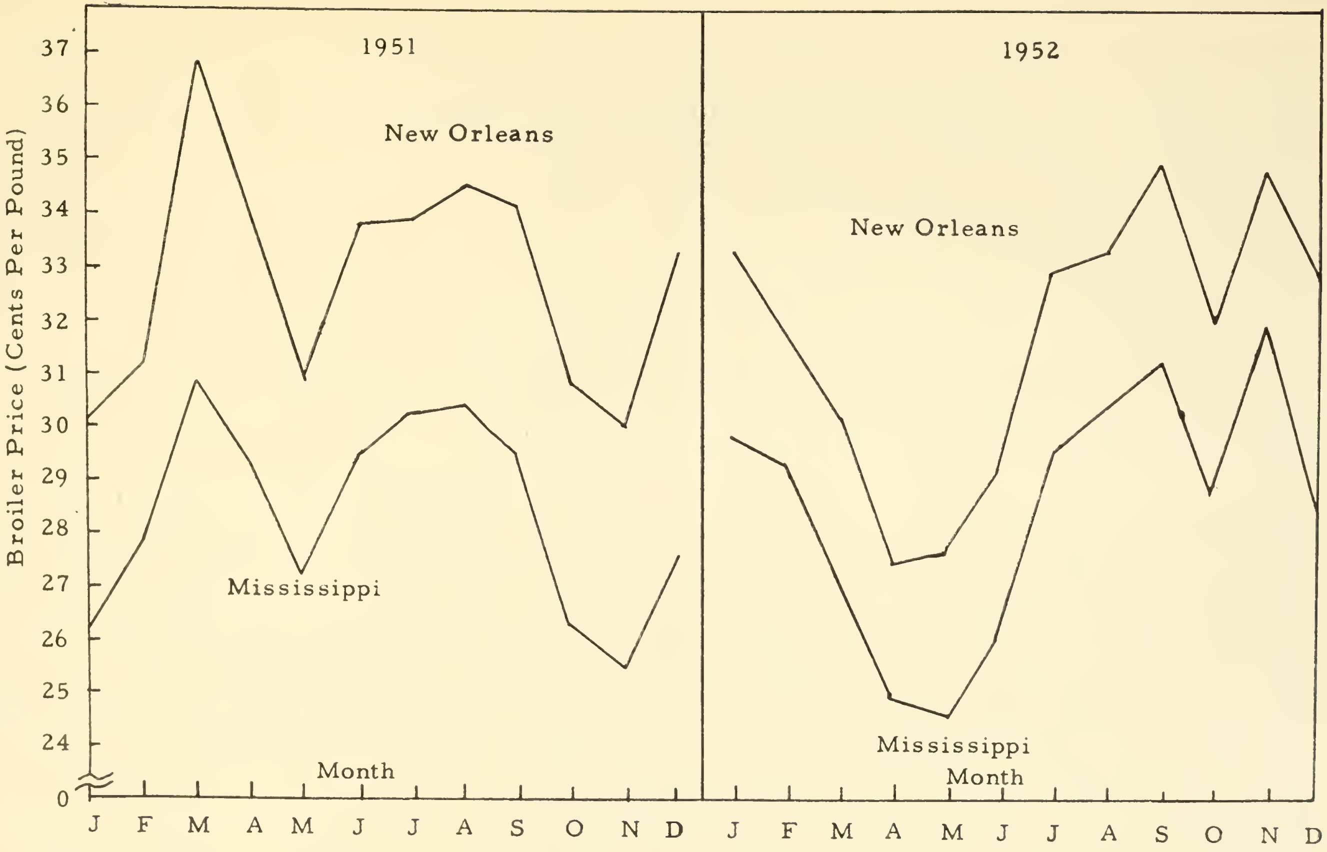
[4] For a discussion of the problem involved in determining the most profitable time to sell see E. L. Baum and H. G. Walkup, "Economic Considerations in Fryer Production and Marketing in the Pacific Northwest," **Journal of Farm Economics**, Vol. 33, No. 1, Feb. 1951, pp. 90-107.



Source: U.S.D.A., P.M.A., Daily Market Report, Jackson, Mississippi, January 1951-December 1952.

Figure 4. Average monthly broiler prices, Mississippi and New Orleans, 1951-1952.

dealers had very close relationships with processing plants which handled their birds.

Producers selling on out-of-state markets received about the same price as those selling on markets within the state.

The cost of marketing through alternative outlets was not ascertained in this study. The general charge for hauling birds from the farm to the processing plant within a market area was about 1.0 to 1.5 cents per pound. No effort was made to determine the cost of moving birds from one market area to another. There was a margin between Mississippi prices and New Orleans prices, which range from 2 to 6 cents per pound, Figure 4.

Mississippi is divided into 3 areas for the purpose of Federal-State Market News service. Broiler prices are quoted for north Mississippi, central Mississippi, and southwest Mississippi. Activity in these areas is concentrated around Tupelo in north Mississippi, Jackson, Morton and Pelahatchie in central Mississippi and McComb in southwest Mississippi. There is a close relationship among market prices of broilers in the major producing areas of the United States. Prices tend to fluctuate simultaneously in different market areas. Figure 4 shows the relationship of the average monthly prices paid for broilers in New Orleans and Mississippi for 1951 and 1952. Prices in northwest Arkansas, north Georgia and in Delmarva production areas were about the same as the Mississippi price, while the price at St. Louis was more nearly comparable to the price at New Orleans.

Seasonality of Sales and Prices

Figure 5 illustrates the seasonal movement in the volume of sales for the period studied. The proportion of total sales for the year ranged from 21.7 percent in the second quarter to 31.2 percent in the fourth quarter.[5] Sales in the first and third quarters amounted to 22.4 and 24.7 percent, respectively. Figure 5 also shows the relationship of price to volume of sales. There are several possible explanations which may throw some light on this relationship. The high price during the first quarter was probably influenced by a low supply coming on the market during the hot summer period when the demand was high relative to the other period. Moving into the second quarter, it is noted that price declined rapid-

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[5] The year studied was divided into quarters with the first quarter beginning July 1, 1951.

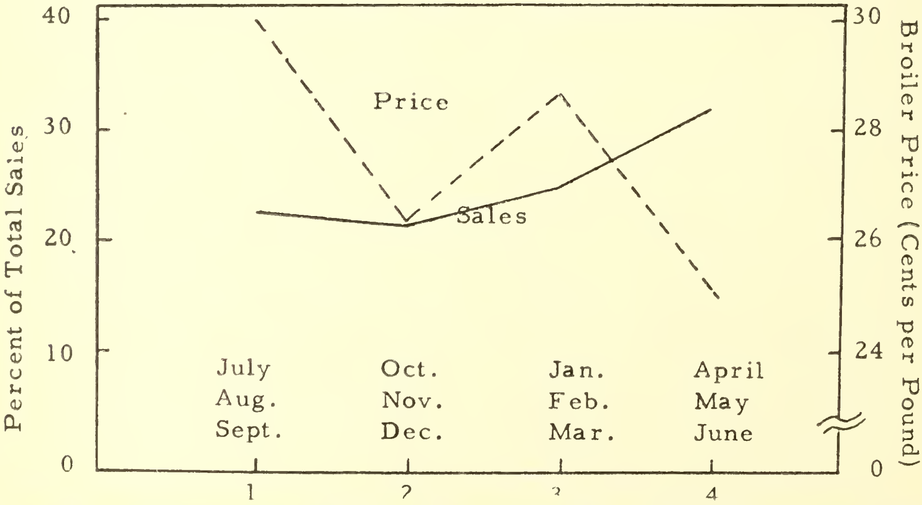
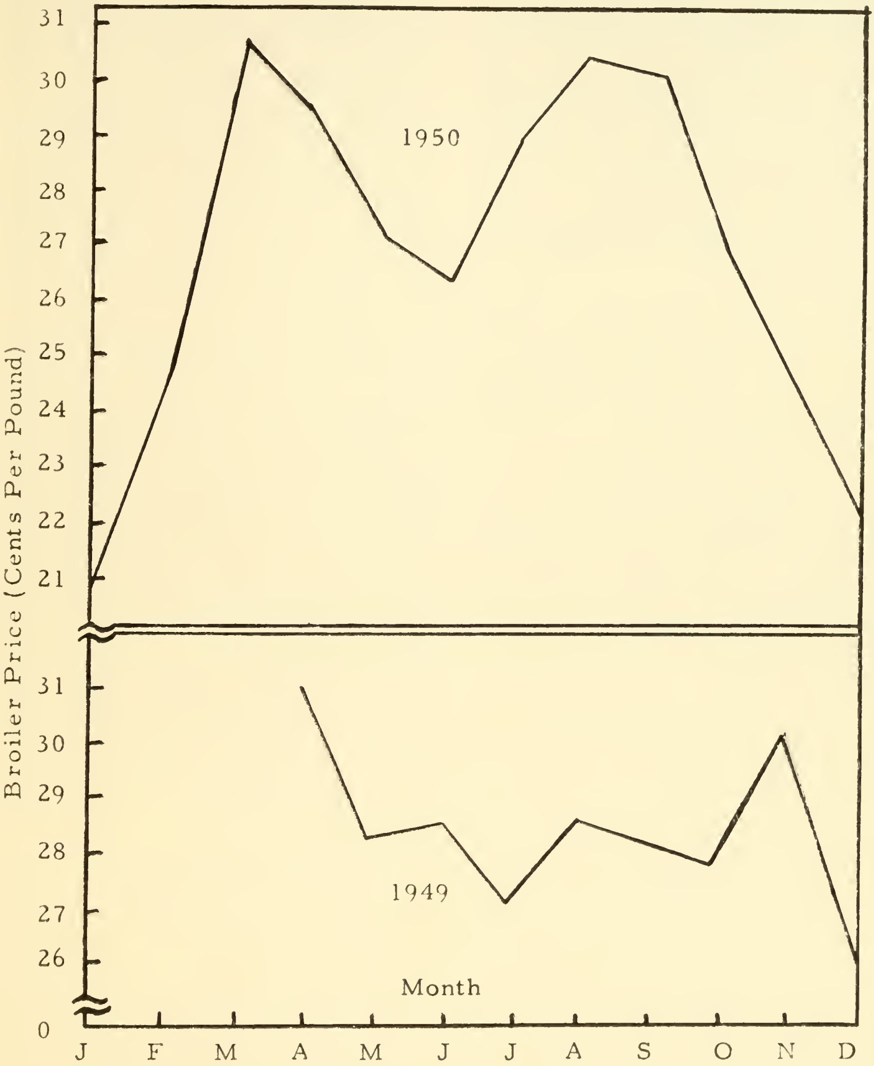


Figure 5. Seasonal fluctuations in volume of sales and price of broilers, Mississippi, July 1951 - July 1952.

ly and sales decreased slightly. This is probably related to cooler temperatures and the high Thanksgiving and Christmas consumption of turkey. Both volume of sales and price increased during the third quarter. A sharp decline in price occurred in the fourth quarter which can probably be accounted for



* Broiler price quotations for Mississippi began in April, 1949.

Source: U.S.D.A., P.M.A., Daily Market Report, Jackson, Mississippi, April 1949-December, 1950.

Figure 6. Average monthly broiler prices, Mississippi, 1949* - 1952.

to a great degree by the relatively large supply placed on the market during this period.

Figure 6 shows the average[6] monthly price fluctuations for Mississippi broilers from April 1949[7] through December 1952. In general, there were two periods of relatively high prices and two periods of relatively low prices. One period of higher prices occurred between January 1 and March 31 while the other occurred between July 1 and September 30. One period of low prices tended to prevail between April 1 and June 30, while the other occurred between October 1 and December 31, Figure 6.

The monthly average price for the entire period, April 1949 through December 1952, is shown in Figure 7. Prices were low for January, May, and December and were high for March, August, and September.

CREDIT FACTORS

Financing constitutes one of the most important elements in the production of broilers in Mississippi. Most producers operate on a credit basis. Therefore, it is necessary to consider the amount of credit needed, the source of credit, and corresponding conditions for supplying credit.

Financing Requirements

The broiler production period is usually about 10 weeks. As a result, direct production costs are financed under a short-term credit system. Longer-term credit is needed to finance construction of broiler houses and equipment. However, long-term credit for buildings and equipment does not usually come from the same credit agency as does the credit used in financing short-term production costs.

Operating capital requirements of broiler producers. It is difficult to estimate the total amount of credit needed by the broiler industry for any given production period. It will be dependent upon the number of broilers on feed during that period, the amount of capital the producer has to invest in the enterprise, and the manner in which the individual broods are staggered within the period. Some may reach the market stage during the first week of the period while others may not be ready to sell until near the end of the period.

For 50 feed dealers, the amount of credit extended per 1,000 broilers marketed during the week of June 15 to June 22, 1952, ranged from $260 to $1,000. The average credit extended by the 50 dealers was $668 per 1,000 birds sold. This covered only production items such as chicks, feed, medicine, fuel, etc.

Of the 52 dealers from whom records were obtained, 48 reported a total of $1,708,474 of broiler credit outstanding to producers as of June 15, 1952. These 48 dealers were furnishing feed and supplies for 4,763,350 broilers during the week of June 15 to June 22. The total credit outstanding was not indicative of the normal amount required, since part of it was represented by delinquent accounts. Part of the delinquent accounts can be attributed in some degree to the abnormal slump in broiler prices which occurred in the spring of 1952. On the other hand, it is probable that something above the credit required to finance actual production costs may be necessary in order for dealers to be able to cope with such emergencies as drastic price decline.

Long-term capital requirements of broiler producers. The amount of long-term credit needed to finance buildings and equipment was small in comparison with the short-term credit utilized in the broiler industry. Long-term credit was utilized by a much smaller percentage of growers than was short-term credit. Of the 220 producers interviewed, 82 borrowed to finance construction of the broiler houses and 79 borrowed to finance equipment when they went into the broiler business. Subsequent expansion or improvement of broiler houses was financed on a credit basis by 38 producers, while 37 producers borrowed to buy new equipment. The average investment in broiler houses, brooders, feeders, and waterers amounted to about $303 per 1,000 capacity for all producers included in the study. Since many producers did not borrow to finance houses and equipment, the total amount of long-term credit needed was relatively low. The long-term credit need for producers already in the business will decrease as part of the long-term credit is liquidated, except as additional credit is required for ex-

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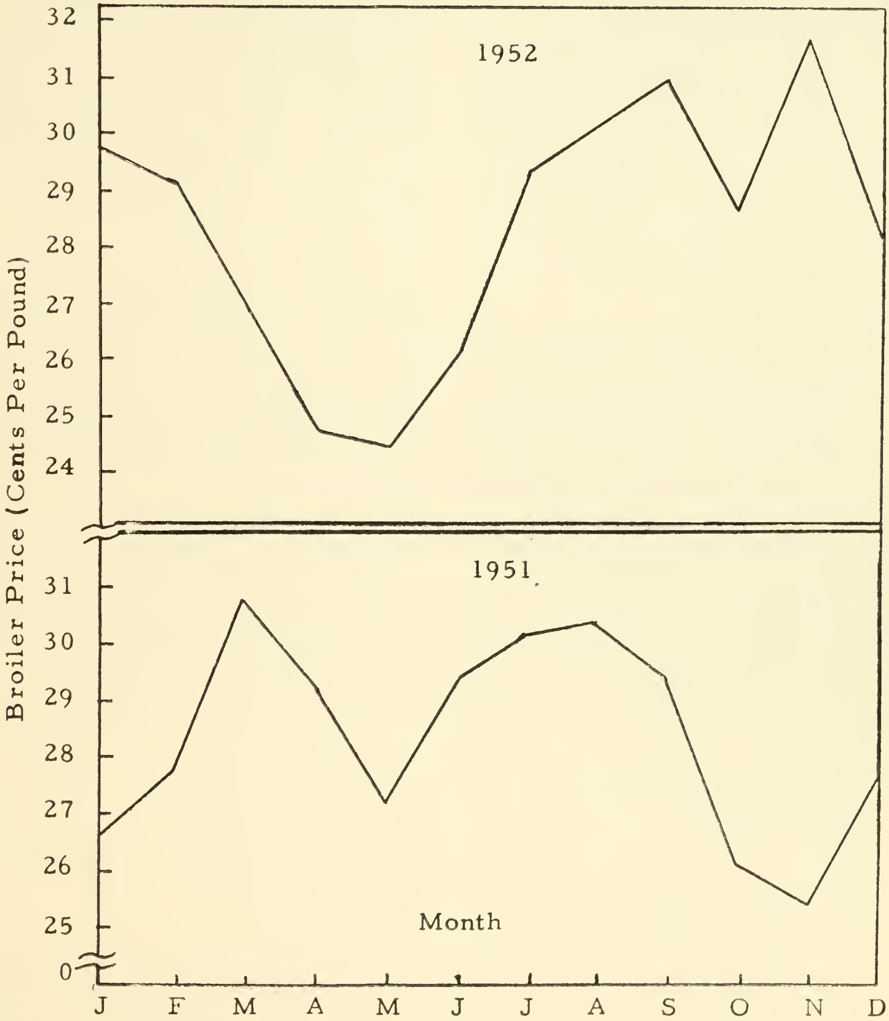
[6] A simple average of prices was considered adequate since no trend was apparent.

[7] April, 1949, marked the beginning of broiler price quotation in Mississippi.



Source: U.S.D.A., P.M.A., Daily Market Report, Jackson, Mississippi, January 1951-December 1952.

Figure 7. Average price for broilers, by months, Mississippi, 1951-1952.

pansion of the existing enterprise, and for replacement of worn-out buildings and equipment.

Financing feed dealers. Several credit arrangements with feed companies were being used among the dealers interviewed. No standard procedure was indicated in these arrangements, except that the term of credit was almost invariably a 90-day period.

Many dealers were not charged a specific amount for credit extended by the feed company. Credit information was obtained from 43 dealers, of which 19 indicated that they were charged a specific amount for credit extended by the feed company. The charge per annum ranged from 4 to 6 percent interest for 16 dealers, while 3 reported that charges were made on some other basis, Table 12.

Security for credit extended may be divided into two types; tangible and intangible. Tangible security usually took the form of chattel mortgages, promissory notes, etc. Only 10 of the 43 dealers were required to submit tangible security as a basis for obtaining credit from the feed companies. However, such intangible security as financial statements and the reputation of the dealer usually sufficed.

In addition to obtaining feed on a credit basis, 15 dealers also used credit to obtain the chicks and supplies which they furnished to growers. In contrast to "trade-credit" utilized in securing feed; chicks and supplies were usually obtained by a "cash-credit" procedure. This consisted of the dealer securing a cash loan from a commercial lending agency and then purchasing the chicks and supplies for cash. In most cases, cash loans were for a 90-day period and an interest charge of 6 percent was usually made. Tangible security in the form of property mortgages, promissory notes, chattel mortgages, etc., was required in most cases of cash loans.

Table 12. Credit specifications on feed supplied to 43 dealers by feed companies, Mississippi, 1952.

No. dealers per arrangement	Credit term (days)	Credit charge*	Security required
19	90	None	None
13	90	0 to 6%	None or Promissory Note
3	90	$1 ton	None or Promissory Note
3	7-70	None	None or Financial statement
2	90	0 to 6%	Chattel mortgage
2	90	0 to 6%	Financial statement

*Percent unless otherwise specified.

Cash loans were obtained by 4 dealers for the purpose of financing baby chicks only, while 4 other dealers used a cash loan only to obtain supplies. Cash loans were used by 15 dealers for the purpose of financing both chicks and supplies. Only 2 dealers reported that they did not use credit to obtain feed, chicks, and supplies.

Financing producers. Most producers did not have sufficient cash to finance their broiler operations. Although many growers had sufficient net worth which could be used as collateral for loans from established credit agencies, it was found that very few of the broiler producers were financed in this manner. Only 2 of the 220 producers interviewed had tried to get a cash loan to produce broilers. This is indicative of the characteristic development of the broiler industry. Throughout the development of the industry there has been a very close relationship between producers and feed dealers. In addition to being the agents for production supplies, dealers have also been an important source or medium through which improved technology in management and disease control has been disseminated to the growers. For all practical purposes, this situation has placed the broiler industry on what amounts to a partnership between dealers and producers in growing broilers.

The industry has grown up on a basis of credit extended to dealers by the feed companies and banks which have enabled the feed dealer to extend credit to the producer. A considerable degree of interdependence has developed within the industry. This may account for the fact that commercial lending agencies have not been very active in financing broiler productions through

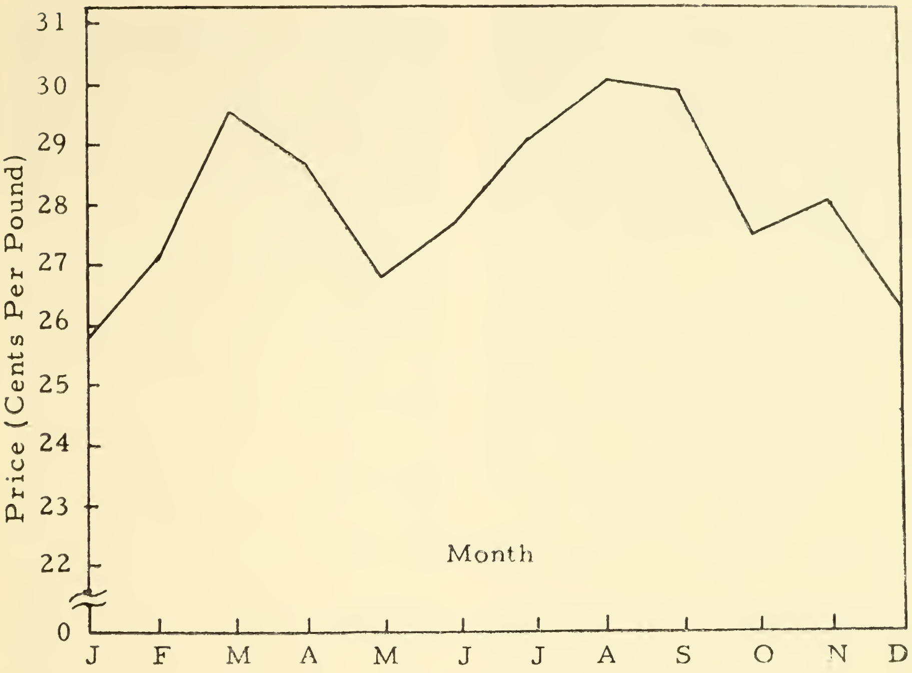


Figure 8. Average price for broilers, by months, Mississippi, 1949-1952.

direct loans to producers but, instead, have financed it mainly through loans to dealers and producers.

Financing Broiler Production Under Various Plans

Several distinct types of plans were found to be in use in the area studied. They consisted of: (1) open-account, (2) flat-fee, (3) feed-conversion, (4) salary basis, and (5) cash basis.

Characteristics of various plans. A wide variety of conditions has given rise to a need for financing plans which allocate the responsibility and risk differently between the dealer and the grower. Characteristics of the various plans will be discussed at this point; however, their implications will be discussed subsequently in considering their effects on the dealer-producer relationship with respect to management and marketing decisions.

The open-account plan was the most widely used in Mississippi. Under this plan, the grower is furnished feed and such other production supplies which he may need by the feed dealer. The agreement may be an oral or a written contract between the dealer and the grower.[8] Generally the title to the birds is vested in the dealer and the grower agrees not to sell the birds without the consent of the dealer, although this is usually an oral agreement. In most cases, the agreement places the responsibility for marketing birds on the dealer; however, the grower is at liberty to designate the buyer, if he can find one who will pay a higher price than the dealer is able to obtain. The open-account plan usually places most of the risk on the grower. The grower is liable for any balances resulting from the total proceeds of the sale not being sufficient to cover the amount of credit extended by the dealer. However, it must be borne in mind that the dealer is not completely absolved of the risk element in that he may not be able to collect from the grower if a loss occurs.

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[8] Grower and producer are used interchangeably in this manuscript.

A few isolated cases were noted where the dealer agreed to assume part of the loss, if any occurred, under the open-account plan. Several open-account producers indicated that the dealer would cancel all losses incurred on a particular brood provided the grower agreed to produce another brood with the dealer.

The open-account plan provides for the grower to receive any part of the total proceeds from the sale of the birds which may remain after the credit account for the brood has been settled. The open-account agreement further provides that the grower will take proper care of the birds in accordance with the dealer's instructions and recommended management practices. Failure to do so constitutes sufficient cause to void the contract. In case the contract is voided by the producer, the dealer has the right to remove the birds from the premises of the grower and dispose of them at his discretion. The grower would still be liable for credit extended prior to the removal of the birds by the dealer. If the dealer fails to fulfill his responsibility of providing feed and supplies when needed, the producer would have recourse through judicial channels. It is significant to note that the study revealed no such occurences materializing in the case of producers or dealers.

The second most widely used plan was the flat-fee arrangement. Under this plan, the dealer furnishes feed, chicks, and supplies to the grower and specifies what the grower will receive for raising the broilers. The grower may be paid either a flat rate in cents per head for the number of broilers sold or payment may be based on a flat rate in cents per pound for the number of pounds sold. In some cases a flat rate per head may be paid for the number of chicks placed. Profits remaining after the flat fee is paid and the total cost of production has been covered, may be split between the grower and the dealer or may accrue entirely to the dealer.[9] Of 42 producers operating under the flat-fee plan, 25 indicated that the dealer received all the profit above the direct cost of production and the flat fee, while 17 producers reported that such profits were shared on a 50-50 basis by the grower and the dealer.

Data obtained from feed dealers indicated that the usual amount paid to the producers under the flat-fee plan was 5 to 6 cents per head on the numbers of broilers sold. Some dealers reported that they would pay the growers at the rate of 2.5 to 3.0 cents per pound if they did not want to operate on a per-head basis.

Some discrepancy was noted between data reported by dealers and those reported by growers with respect to the rate per head which was paid under the flat-fee arrangement. Several producers indicated that they received as much as 10 cents per head for growing broilers; whereas, dealers did not specify paying over 6 cents per head.[10]

Under the flat-fee plan, dealers assume the loss if total proceeds from the sale of the birds is not sufficient to cover the cost of feed and supplies expended on the brood. The dealer has the responsibility of marketing the broilers. He retains title to the birds during the growing period and maintains supervision over the management. The third type of plan used among the dealers and producers included in the study is based on the ratio of the pounds of feed utilized per pound of meat produced. This is known as the feed-conversion plan and differs markedly from either the open-account or the flat-fee arrangement.

Dealers set up this plan by dividing the probable feed-conversion range into arbitrary segments and specifying the price per pound that will be paid under each segment. This may be illustrated by a hypothetical example. Suppose the range of feed conversion for a particular production area lies between 2.5 and 3.5 pounds of feed per pound of meat produced. The dealer might then draw up a plan whereby he would pay the grower 5 cents per pound if his feed conversion was 2.50 to 2.65; 4 cents per pound with a feed conversion of 2.66 to 2.90; 3 cents per pound for a feed conversion of 2.91 to 3.10; and 1 cent per pound if the feed conversion was 3.11 to 3.50.

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[9] Cost of production under the flat fee is based on the amount the dealer charged to the production unit for the inputs and not on the actual cost of the inputs to the dealer.

[10] This apparent discrepancy may have been a result of the producers converting a per pound rate into an average rate per head.

Under the feed-conversion plan the dealer assumes the loss if the gross returns from the sale of the broilers is not enough to pay the producer and the direct cost incurred in production. Dealers maintain title to the birds and supervise management practices in much the same way as under the other plans discussed.

In addition to the plans described above, it was found that some broilers were produced on a salary basis. Under this plan, the dealer may own the houses and equipment and merely hire someone to raise the birds for him. In still other cases, the producer may own the houses and equipment and hire out his services to the dealer. The dealer will usually base the salary on the number of broilers which the individual raises during the production period. All marketing and management decisions are made by the dealer. This plan was not widely used in Mississippi.

A small percentage of broilers in Mississippi were grown on a cash basis. Producers paid cash for all feed and supplies and had complete responsibility for management and marketing decisions. All risk was borne by the grower and the profits, if any, accrued to the grower.

Attitudes of dealers and producers toward different plans. It is evident that different plans cause a variation in the relationship between dealers and producers. A particular plan may be favored over alternative plans depending on the current conditions prevailing and the short-run outlook.

Many dealers, during the interview, implied that they favored the open-account plan in all cases, but that it was sometimes necessary to offer alternative plans as a means of retaining their producers.

Producers, as well as dealers, are influenced in their preference of plans by the risk involved. Although the open-account plan grants them more freedom in management practices and decisions, it also leaves more of the risk of losses to be borne by them. If the price outlook is not too favorable, growers may be inclined to try to shift from the open-account plan to one that will guarantee them a specified amount. In this manner, they are assured of some returns to labor although they may not have as much freedom to participate in management and marketing decisions. In the event that no other plan can be agreed upon with their current dealer, some growers may shift to other dealers, while some will temporarily refuse to place another brood.

Degree of utilization of various plans. As previously stated, most producers involved in the study were using the open-account plan.

Of the 220 producers studied, 173 used the same type of plan for all broods produced during the period studied. Table 13 indicates that 146 of these 173 growers used only the open-account plan; whereas, 16, 6, 3, and 2 used the flat-fee, feed-conversion, cash and salary plans, respectively.

The remaining 47 of the 220 growers

Table 13. Distribution of 173 broiler producers by type of plan used, seven counties, Mississippi, July, 1951-July, 1952.

County	Type plan					Total
	Open account	Flat fee	Feed conversion	Cash	Salary	
Itawamba	36	4	1	1	—	42
Lee	5	—	—	1	—	6
Pike	15	—	—	—	—	15
Rankin	19	1	—	1	—	21
Scott	28	6	2	—	1	37
Simpson	16	—	—	—	—	16
Smith	27	5	3	—	1	36
Totals	146	16	6	3	2	173

interviewed used 2 or more different plans during the year studied. Table 14 shows that the flat-fee and feed-conversion plans gained in popularity with the producers during the year studied while a considerable decrease was noted in the use of the open-account and cash methods of financing production. Probably, this can be attributed to the desire of growers to shift more of the risk to the feed dealer especially since this period was characterized by some very low prices. Under the open-account, the grower not only bears the risk of no return to labor, but also takes the risk of incurring a sizeable debt on the brood. A few instances were noted where the risk to the producer was somewhat mitigated by the dealer establishing a minimum price per pound that would be paid to the grower. Another exception was noted where the open-account agreement specified that any loss would be borne by the dealer. Producers operating under such a plan would only run the risk of no returns to labor and fixed investment.

Effects of Finance on Production Decisions

The relationship between financing and production management in the broiler industry has previously been indicated. Different plans of financing result in a different allocation of duties and responsibilities between the dealer and the grower.

Distribution of production decisions relative to type of financing plan used. The responsibility for making production decisions may fall anywhere on a scale running from full responsibility at the dealer end to full responsibility at the producer end. In the broiler industry, the grower has full responsibility and freedom to make all decisions only under the cash plan. This is not intended to imply that he never seeks advice from any other source; however, he does have the right to operate the enterprise as he sees fit.

At the other extreme of the scale the dealer is responsible for all decisions. The salary basis represents this type of arrangement. The dealer furnishes everything except labor. He hires someone to grow the birds for a specified salary. The dealer is at liberty to make all management decisions.

Open-account, flat-fee, and fee-conversion plans allocate responsibility somewhere between the two extremes mentioned above. In most types of enterprises, the open-account plan would mean that the grower held about the same position with respect to the responsibility for production decisions as the cash grower. However, this is not true in the broiler industry where practically all open-account agreements specify that the grower will care for the birds in the manner indicated by the dealer.

Table 15 indicates that the grower has more control over the production decisions under the open-account plan than under either of the other credit plans. However, a highly significant proportion of the production decisions were made by the dealer, even under the open-account plan. It is necessary to add at this point that the distribution of decisions reflected in Table 15 was not necessarily compulsory on the part of either the dealer or the grower. For instance, dealers decided when to start chicks for 15 percent of the open-account producers. It is highly probable that some or all of the 15 percent were free to make their own decision on when to start the chicks; however,

Table 14. Distribution of type of plan used per brood, for number of growers indicated, Mississippi, July, 1951-July, 1952.

Brood	Type plan						Total no. of growers
	Open account	Flat fee	Feed conversion	Cash	Salary	Other	
	Number						
First	38	1	1	5	1	1	47
Second	30	9	2	3	1	2	47
Third	18	17	6	2	0	1	44
Fourth	8	18	0	0	0	0	31

Table 15. Distribution of production decisions under various financing plans, 216 broiler producers, Mississippi, 1952.

Managerial decision	Type plan Open account	 Flat fee	 Feed conversion
	Percent*		
When to start chicks			
Dealer	15.1	16.7	40.0
Grower	66.7	35.7	40.0
Joint	18.2	47.6	20.0
Breed or strain to grow			
Dealer	55.3	64.3	73.3
Grower	34.6	19.0	20.0
Joint	10.1	16.7	6.7
How many to start			
Dealer	17.6	33.3	40.0
Grower	73.0	50.0	33.3
Joint	9.4	16.7	26.7
Type of feed to use			
Dealer	71.7	83.3	80.0
Grower	22.0	9.5	13.3
Joint	6.3	7.2	6.7

*Based on 159 open account, 42 flat fee, 15 feed conversion contracts.

they might have sought and followed the advice of their dealer. An interpretation of Table 15, as reflecting a static relationship between dealers and growers, would lead to erroneous inferences. Dealer interviews indicated that those producers, who had proven to be efficient were given considerable freedom in their operations.

As would be expected, the growers had a smaller share in making production decisions under the flat-fee and the feed-conversion plans than those who produced under open-account. Under the flat-fee plan the grower transfers more of the responsibility and risk to the dealer and, consequently, the dealer's privilege in supervising management expands.

Relationship of risk assumption and distribution of production decisions. In order to have freedom in making his production decisions the grower would have to pay cash for his feed and supplies and assume all the risk involved. This is seldom done in the broiler industry. Most producers are willing to relinquish some of their privileges in making decisions as a means of transferring some responsibility and risk to the dealers. This arrangement may properly be considered a part of the cost for credit and/or services extended by the dealer, although it is intangible in nature and not subject to evaluation with the same degree of ease as in the case of mark-ups on feed and supplies. Sharing the production supervision is the element which characterizes the broiler industry as operating on a practical partnership basis.

Each individual case of financing may be different in that characteristics and capabilities differ among producers. Dealers would be criticized if they were known to discriminate among growers with respect to feed prices. Therefore, there is a tendency for the dealer to charge the same price for feed to all his credit producers and to make adjustments through the methods of financing for different producers. However, this does not mean that all growers under a particular plan have the same working relationship with the dealer in regard to production decisions. There are indications that dealer supervision may be more pronounced in the case of new producers or older ones who have not demonstrated their ability to grow broilers efficiently.

Effects of Financing on Marketing Decisions

There are certain marketing decisions such as, (1) when to sell, (2) where to sell, and (3) what price to accept among those offered by alternative outlets, that are closely related to the gross and net returns obtainable from the sale of a product. For most farm products, these decisions are ordinarily made by the grower; however, it has previously been stated that broiler marketing varies considerably from the usual practice.[11]

Relationship of risk distribution to marketing decisions. Table 16 shows the degree of dealer and producer participation in marketing decisions under various financing plans. Although the producer assumed the major part of the risk under the open-account plan, a large proportion of the marketing decisions were still made by the dealer. Whether this was indicative of a real or an imaginary difficulty facing the producer in the marketing function is questionable.

Table 16 indicates that dealer participation in marketing decisions was somewhat greater in the case of the flat-fee and feed-conversion plans, where the returns to the dealer were more dependent upon the outcome of the selling job than they were in the case of open-account arrangements.

The caution against interpreting the data of Table 15, as reflecting a static relationship between the dealer and the grower, is also applicable to the data of Table 16. It must be borne in mind that many marketing, as well as production decisions may have been entrusted to the dealers on a purely voluntary basis by the growers.

Relationship of dealers to market outlets and market information. Since dealers were almost invariably the source of production credit and performed a large proportion of management and marketing decisions, they were necessarily concerned with market outlets and market information.

Of the 52 dealers interviewed, 24 indicated that they had no arrangement with an outlet prior to the time the broilers were ready for market. An additional 12 dealers reported that they made contact with an outlet during the week preceeding the sale of the birds, Table 17. No data on market arrangements were obtained for 4 dealers, while 2 dealers had semi-permanent arrangements and 10 dealers had permanent arrangements for the disposal of their birds.

Table 18 gives a breakdown of permanent market arrangements with respect to particular specifications. Only one out of 10 arrangements failed to indicate the number of broilers the buyer would take. Time of delivery was specified in 5 of the 10 cases. Of the 10 arrangements, only 2 specified the price to be paid. None of the 10

Table 17. Distribution of feed dealers by arrangement with broiler buyers, Mississippi, 1952.

Arrangement with buyer	No. of dealers
Made at time of sale	24
Made during week prior to sale	12
Semi-permanent	2
Permanent	10
No data	4
Total	52

Table 18. Specifications of permanent arrangement with broiler buyers, 10 feed dealers, Mississippi, 1952.

Arrangement specified	Number	
	Yes	No
Number buyer will take	9*	1
Time of delivery	5	5
Price to be paid	2	8
Discount or premium	—	10
Market to be used for pricing	7	3

*Includes arrangements where buyer agreed to take all the dealer had to sell.

Table 16. Distribution of marketing decisions under various financing plans, 216 broiler producers, Mississippi, 1952.

Marketing decision	Type plan		
	Open account	Flat fee	Feed conversion
		Percent*	
When to sell			
Dealer	39.6	71.4	53.4
Grower	32.1	2.4	13.3
Joint	28.3	26.2	33.3
Where to sell			
Dealer	79.2	90.5	73.3
Grower	8.2	—	6.7
Joint	12.6	9.5	20.0
Price to accept			
Dealer	83.0	88.1	86.6
Grower	6.3	2.4	6.7
Joint	10.7	9.5	6.7

*Based on 159 open-account, 42 flat-fee, 15 feed-conversion contracts.

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[11] see page 16.

permanent arrangements specified a premium over the market price or a discount from it. The market to be used for pricing was specified in 7 cases and was usually the market quotation for the area within which the dealer was located.

No observations were noted which would lend validity to the belief of some growers that the dealers controlled the broiler market. It appears that it would be in the best interest of the dealer as well as the grower to obtain the best market available. No cases of deviation from the quoted market price in the form of premiums or discounts were noted, except in the cases previously discussed where the minimum price which would be paid the producer had been established.

Market information is readily available to the dealer in the form of market quotations. It requires only a small amount of time to contact all the processing plants within the area and ascertain their relative desirability as outlets for birds ready for market.

SOME EFFECTS OF FINANCIAL STRUCTURE ON THE BROILER INDUSTRY AND GENERAL AGRICULTURAL ECONOMY

The nature of the financial structure affects the broiler industry in several important ways. It has an influence in the determination of returns to producers, the size of the industry, stability of the industry, and producer incentives.

The financial structure also has an influence on the agricultural economy in general, since it affects the development of a new farm enterprise in the farming system and has a bearing on farm income and the allocation of resources. The purpose of this chapter is to discuss the various influences indicated above.

Comparison of Costs and Returns Under Various Plans

For most farm enterprises the returns to producers are influenced by: (1) cost of inputs, (2) the price received for the product, (3) ratio of inputs to output, and (4) quantity of product produced.

The financial structure of the broiler industry does not conform to the usual pattern, however, in that determination of returns to growers may involve an additional factor. This additional element is directly related to the type of financing under which the birds are grown. For instance, a producer may agree to raise broilers for a dealer under a flat-fee plan which will insure him a fixed rate per head for all broilers grown. The feed dealer furnished everything except labor in some cases and everything except houses, equipment, and labor in others. In such cases, returns to growers are not related to the cost of inputs, ratio of input to output, or the price of broilers, but are determined by the specific rate per head which is agreed upon and the number of broilers produced.

Table 19 has been designed to show the method of calculating labor returns to producers under the different plans. The relative number of producers whose labor returns could be calculated according to the various methods shown in Table 19 is constantly fluctuating; therefore, it is evident that the financial structure of the industry is conducive to a wide variation in the labor returns to the aggregate of producers.

In order to evaluate the effects of various financing plans, it is necessary to compare the relationship of costs and returns under different plans. This discussion will exclude overhead cost for houses and equipment. It is assumed that the type of financial plan used will have little, if any, effect on the overhead cost, since long-term credit is usually obtained from a source other than the dealer.

Cost and return data on broods grown on feed-conversion and a salary basis were not sufficient to justify analysis. However, some discussion on a theoretical basis may give a better understanding of the financial structure as a whole.

Table 20 contains comparative cost data and related information for broilers grown under the open-account, flat-fee, and cash arrangements.

Table 19. Methods of calculating labor returns to producers under various broiler financing plans, Mississippi, 1952.

Type contract	Specifications	Method of calculating labor returns to producer
Cash		TP — DC — D-INT. = LR
Open-account		Same as above
Flat-fee	FF per head on NS	FF (NS) — D — INT. = LR
	FF per head on NP	FF (NP) — D — INT. = LR
	FF per head on NS + ½ profit	FF (NS) + ½ (TP — DC) — D — INT. = LR
	FF per head on NP + ½ profit	FF (NP) + ½ (TP — DC) — D — INT = LR
	FF per head on NS*	FF (NS) = LR
	FF per head on NP*	FF (NP) = LR
	FF per pound sold	FF (No. lbs. sold) — D — INT. = LR
	FF per pound sold + ½ profit	FF (No. lbs. sold) + ½ (TP — DC) — D — INT. =LR
Feed-conversion	1 to 5 cents per pound sold	FCR (No. lbs. sold) — D — INT. = LR
	1 to 5 cents per pound sold + ½ profit	FCR (No. lbs. sold) + ½ (TP — DC) — D — INT. = LR

*Dealer furnishes everything except labor.

TP = Total proceeds of sale.
DC = Direct cost
D = Depreciation
INT = Interest on investment
LR = Labor returns
FF = Flat fee
NS = Number sold
NP = Number placed
FCR = Feed conversion rate

Table 20. Cost data and related information, open-account, flat-fee and cash plans, Mississippi, 1952.*

Weighted average	Unit	Cost per unit		
		Open account	Flat fee	Cash
			Dollars	
Cost of chicks	100 chicks placed	16.30	16.20	16.00
Cost of feed	100 pounds	6.17	6.34	5.64
Cost of medicine	100 chicks placed	1.19	1.46	1.05
Cost of fuel	100 chicks placed	1.83	1.97	1.46
Miscellaneous cost	100 chicks placed	0.93	0.61	0.40
Variable cost	Pound produced	0.258	0.292	0.239
Pounds per bird	Bird	2.8**	2.7**	2.8**
Feed conversion	Lb. meat sold	3.0***	3.44***	3.0***
Price received	Pound	0.268	0.249	0.272

*Approximately 1,000,000 broilers were included in the data used to calculate cost for open-account group, 283,000 for the flat-fee group and 102,000 for the cash group.

**Pounds.

***Feed-conversion-pounds of feed per pound of live broiler produced.

Cost of baby chicks. The weighted average price paid for baby chicks under the open-account plan was $16.30 per hundred chicks as compared with $16.20 under the flat-fee and $16 under the cash plan. The difference in chick cost between open-account and flat-fee plans was not found to be statistically significant.

Cost of feed. Open-account growers paid a weighted average price of $6.17 per hundred pounds of feed, while flat-fee and cash producers paid $6.34 and $5.64, respectively.

Although the price of feed was significantly higher under the flat-fee, this does not necessarily mean that producers were affected adversely in all cases, since it would affect the returns to only those producers whose contract with the dealer specified that profits would be shared on a 50-50 basis. If the contract calls for a flat fee to be paid to the producer, with all profits going to the dealer, the quoted feed price will have no bearing on the returns to the producer.

Although feed cost for cash producers was much lower than for open-account and flat-fee growers, it must be borne in mind that the small number of cash producers, together with the very small number of dealers who had cash customers, preclude the drawing of inferences based on the same degree of probability that exists in the cases of open-account and flat-fee data. The data in Table 20 for cash producers may, however, be considered as an indication of what was achieved in a relatively small number of cases involving a very small number of feed dealers.

Feed cost constituted approximately 73 percent of the total direct cost of producing broilers. Therefore, a slight variation in the cost per hundred pounds of feed would make a relatively large change in the total direct cost of producing a brood.

Feed prices were obtained from 49 dealers for the week of June 9-16, 1952. The average of these prices for different types of feed are shown in Table 21. These figures are not comparable to those in Table 20 for feed cost, since they are simple averages for particular types of feed for a one week period. The feed cost in Table 20 is in terms of a weighted average cost of feed under various financing plans and covers the entire period studied. The average cash price for starter feed not medicated was 12 cents per hundred pounds less than the credit price, 15 cents less in the case of finisher feed, and 16 cents less in the case of single feed.

For medicated feed, the cash price was 13 cents per hundred pounds less for starter feed, 19 cents less for finisher feed, and 17 cents less for single type feed.

The weighted average feed cost per hundred pounds for broods produced on a cash basis, however, was $5.64. This was considerably lower than the average cash price reported by all dealers for any type of feed, Table 21. Most dealers had very few, if any, cash producers; therefore, they had a relatively small differential between cash and credit prices. The cash producers

Table 21. Average protein content and average feed prices for the week of June 9-16, 49 feed dealers, Mississippi, 1952.

Item	Unit	Type of feed		
		Starter	Finisher	Single* feed
Average protein content	Percent	20.8	18.0	20.4
Plain feed:				
Average cash price	Dollars Per cwt.	6.05	5.88	5.98
Average credit price	Per cwt.	6.17	6.03	6.14
Medicated feed:				
Average cash price	Per cwt.	6.07	5.95	6.08
Average credit price	Per cwt.	6.20	6.14	6.25

*Twenty-nine feed dealers reported using a single type of feed throughout the feeding period while 20 dealers indicated that they used a combination of starter ration and finisher ration.

were concentrated with a few feed dealers who sold feed at a price much lower than the simple average price of all dealers.

Cost of medicine. The outlay for medicine in the production of broilers is probably subject to more variation than any other cost item. If healthy chicks are obtained to begin with and the grower follows through with good management practices, the expenditure for medicine may be kept at a minimum.

The weighted average cost of medicine for open-account producers was $1.19 per 100 chicks placed, compared to $1.46 for flat-fee producers and $1.05 for cash producers, Table 20. Some of the difference in medicine cost between open-account and flat-fee producers may be associated with less efficient management on the part of flat-fee producers.

Cost of fuel. Table 20 shows the weighted average fuel cost of open-account producers to be $1.83 per 100 birds placed; whereas, the cost for flat-fee and cash producers was $1.97 and $1.46, respectively. Fuel cost calculations involved only those broods on which a fuel cost was reported and does not include broods raised during the season of the year when fuel was not needed.

Miscellaneous costs. Such items as insurance, cost of litter, and other incidentals were included in the miscellaneous cost item. The weighted average cost of miscellaneous production items was $0.93 per hundred birds placed on open-account, $0.61 for those placed on flat-fee, and $0.40 for those placed on the cash plan, Table 20.

Total direct cost per pound of broilers produced. The weighted average direct cost of producing a pound of broiler meat under the various plans is shown in Table 20. The difference in the cost can be attributed largely to differences in feed cost. There were also indications that flat-fee growers, in general, were less efficient producers. This was evidenced by the difference in the average feed conversion obtained under the three plans shown in Table 20. The weighted average feed conversion for flat-fee producers was 3.44; whereas, both open-account and cash growers obtained an average feed conversion of 3.0.[12] This indicates that serious limitations may be encountered when dealers attempt to absolve the grower of all responsibility except that of placing water and feed before the birds. It also indicates that closer supervision on the part of feed dealers is not sufficient to insure comparable efficiency in production when returns to the grower are not contingent upon the degree of efficiency in feed conversion.

The weighted average direct cost of production for open-account growers was 25.8 cents per pound as compared to 29.2 cents for flat-fee growers and 23.9 cents for cash producers.

Although data were not obtained on enough broods grown on feed-conversion and a salary basis to permit analysis, it is still possible to discuss them in theoretical terms, keeping in mind the cost relationships for open-account, flat-fee, and cash producers discussed above.

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[12] Feed conversion is stated in terms of the number of pounds of feed required to produce 1 pound of broiler.

The feed - conversion arrangement would be expected to yield similar results to the flat-fee arrangement in that the cost of feed per hundred pounds would not affect the returns to the producer, except where the contract calls for a sharing of profits between the grower and the dealer. The feed-conversion contract, however, is different from the flat-fee in one important aspect. The return to the producer is directly related to the degree of efficiency in production as measured by the feed conversion he is able to obtain on a brood. Therefore, he has the maximum incentive for efficient production.

Cost of medicine under the feed-conversion contract would be expected to be about the same as under the open-account and slightly less than under the flat-fee. Illness of any kind on the part of the bird will reduce its feed-conversion efficiency; therefore, it would be expected that growers on feed-conversion contracts would treat their birds as soon as possible, following the observation of symptoms of disease. This would probably result in a lower total medical cost, since treatment in the early stages of infection would probably meet with more ready response from the birds and minimize the length of time required to free the brood of the disease.

It is highly probably that the cost of producing broilers on a salary basis would be much the same as on a flat-fee, since the basic characteristics of the two plans are the same.

Returns to producers. The level of returns to producers for labor used in producing broilers varies widely between the different financing plans. Delinquent accounts of unknown amounts preclude a determination of returns based on the actual amount of money paid the grower at the conclusion of the sale. Determination of returns to flat-fee, feed-conversion, and salary basis growers must be considered on the basis of the actual amount paid the grower at the time of sale, since the proceeds from the sale will not necessarily affect his returns. It must also be borne in mind that depreciation costs and interest on investment have not been deducted from the returns about to be presented.

Table 20 indicates that a margin of 1.0 and 3.3 cents per pound existed between the weighted average direct cost per pound produced and the weighted average price received per pound under the open-account and cash plans, respectively. Most of the difference between the margins can be accounted for by the lower production cost under the cash plan. There was very little difference in the weighted average price recevied for the birds grown under the two plans. The differences in the average direct cost cannot be attributed, in any significant measure, to a difference in management efficiency, since the average feed conversion under each plan was 3.0.

During the period studied flat-fee producers received much larger returns than open-account growers. However, their returns were substantially lower than those obtained by cash growers. The average weighted payment to flat-flee producers was 2.26 cents per pound as compared to the margins of 1.0 and 3.3 cents per pound received by open-account and cash growers, respectively. Returns to growers, based on value of birds, amounted to 9.1 percent for flat-fee growers, 3.7 percent for open-account growers, and 12.1 percent for cash producers.

Although their average production efficiency, as measured by the feed-conversion ratio, was much inferior to open-account producers, the flat-fee growers on the average were able to maintain returns at a level of 126 percent above open-account growers.[13] Returns to cash growers on the average were 46 percent higher than those to flat-fee growers and 230 percent higher than those received by open-account growers.

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[13] It must be understood that these returns are valid only for the economic situation that existed during the study.

Effects of Financial Structure on the Broiler Industry

The significance of the financial structure of the broiler industry will be considered in terms of production control, producer incentives, and stability of the industry.

Control of production. It appears that control of broiler production has not become a major problem. The rate of expansion has not exceeded the increase in effective demand which has insured returns to growers sufficient, in most cases, to keep them in the business and to attract new growers. There is no doubt that the financial structure of the industry has played an important part in the rapid increase in the volume of broilers produced. There appeared to be a considerable degree of competition between feed dealers in their efforts to secure new broiler growers and retain the efficient ones they were already furnishing.

Effect on producer incentives. The financial structure of the broiler industry, as represented by the various plans for producers, resulted in a wide variation of producer incentives. Plans such as the flat-fee and salary plan, where returns to the grower are not related to the cost of production, or management efficiency, cannot be expected to create incentives on the part of growers for most efficient production.

A different situation was found with respect to open-account, feed-conversion and cash plans. Returns to growers operating under open-account and cash plans are contingent upon the cost of inputs, the feed-conversion ratio, and the price of broilers. These plans encourage good management and allow the grower more freedom in the operation of his enterprise.

The conditions of the feed-conversion contract result in a slightly different situation. The grower is not liable for losses resulting from a deficiency of total proceeds of the sale in meeting the cost of inputs as would be the case with open-account and cash growers. However, he still has the incentive to do a good production job in terms of feed-conversion, since the rate per pound which he will receive is dependent upon the feed conversion attained by the brood. He has an additional incentive in some cases where the dealer will split, on a 50-50 basis, any profits remaining after the cost of production and the flat rate per pound have been paid.

Effect on stability of the industry. The financial structure of the industry has developed in conjunction with its growth. It has developed on the basis of relatively high prices and general prosperity. Margins between cost of production and the price received have generally been sufficient to maintain the growers in production and induce dealers to continue to finance production.

The financial structure is such that some of the least efficient growers do not find it necessary to go out of the business before some of the relatively more efficient growers. For instance, if the weighted average feed conversion of flat-fee growers (3.44) is substituted for the weighted average feed conversion of open-account growers (3.0) in Table 20, it will be found that the weighted average direct cost per pound of broiler produced will be increased to 28.5 cents. Consequently, the direct cost of production would exceed the price received for the birds and these growers could not produce under such a situation. They were able, however, to produce under the flat-fee and obtain a weighted average return of 2.26 cents per pound of broilers sold. This situation was apparently accomplished through the reduced margin the feed dealer received.

The industry, as it presently exists, is based primarily on the willingness of dealers to furnish credit and the willingness of growers to undertake production of broilers. There has been little indication that dealers have been conservative in supplying credit. There have been indications, however, that growers during the last year or so have tended to become increasingly dissatisfied with their returns. It appears that dealers will not be able to maintain the present volume in the long-run unless they can and are willing to reduce their charge for feed and supplies. In the absence of a decrease in the cost of feed and supplies, including the charge for credit, dealers are likely to face an increasing demand for flat-fee feed-conversion, or salary contracts on the part of producers.

Effects of Financial Structure on the Agricultural Economy in General

The broiler industry has been effective in helping to utilize surplus labor and as a means of supplementing farm income. Generally speaking, phenomenal returns have not accrued to producers, although industry has provided additional income for many farm families.

Efficiency of the financial structure in establishing enterprise diversification. It appears that prospective growers have not found it very difficult to enter the broiler business. The investment in houses and equipment was relatively low since much of the labor and materials were usually available on the farm. Once the house was constructed and equipped, the producer had little to contend with in securing production credit. He did not need to arrange a mortgage on property or otherwise inconvenience himself except to visit a feed dealer and sign a contract for the delivery of chicks, feed, and supplies. Dealers were usually not insistent on payment of losses when they occurred, but were willing to wait for payment until a brood was sold at a profit.

Relationship of financial structure to farm family income. The manner of financing broiler production may have varying effects on farm family income, depending on the particular type of plan the grower operates under. If he uses the open-account and operates on a year-round basis, there will be considerable fluctuation in the returns per brood. He can expect to sell about 4 broods per year. Some of these sales would probably be made during the higher price period with a relatively large return, while some would be made during low prices with very little, if any, returns to labor.

If the grower is on a salary basis, he will be able to calculate his earnings at the beginning of the year. If he operates on a flat-fee per chick placed (almost identical with the salary basis except in name) he will also be able to calculate his returns for a given period.

Growers who produce broilers under a flat-fee per broiler sold will encounter some variation in returns between broods due to different death rates on different broods. When flat-fee contracts contain the additional stipulation that profits will be shared on a 50-50 basis, it is theoretically possible that returns might exceed the flat-fee rate. There are indications, however, that proceeds from flat-fee sales seldom yield more than enough to meet the production cost carried on the dealers' books after the flat-fee rate is paid, although with a profit sharing arrangement there is a greater incentive for the producer to do a better job in the production process.

Effect of the financial structure on the allocation of resources. The characteristics of the areas in which broilers were usually raised indicated the need for some intensified enterprise. Farms had small acreages and were generally not suited to extensive row-crop production. The broiler enterprise offered an opportunity to utilize available labor which otherwise would have remained idle. It was possible, in many cases, for the enterprise to be included in the farm operations without requiring additional attention from the owner, since women and children performed the necessary labor. The ease with which production credit could be obtained and the prospects of supplementing income have led many farmers into broiler production.

SUMMARY AND CONCLUSIONS

Broiler production has become increasingly important as a farm enterprise in Mississippi during recent years. Many important questions and problems remain unanswered and unsolved because the enterprise is relatively new and sufficient study has not been made.

Objectives of the study were to relate marketing practices and financing methods to returns to growers and to evaluate the effects of the financial structure on the stability of the industry.

Farms involved in the study were not suited to extensive row-crop enterprises. About 87 percent of the broiler growers owned their farms. The average size per farm was 85 acres, of which 19.2 acres were in cultivation and 41.2 acres were in hay and pasture. About 25 percent of the farms had tractors. Combination of enterprises consisted of small acreages of cotton, corn, hay, truck crops, and small numbers of livestock.

The average broiler capacity per producer was 5,533 birds and the average floor space allowed per bird was .74 sq. ft.

An average of 17 percent of the total assets of producers represented investment in broiler houses, feeders, waterers, and brooders. The average absolute investment in buildings and equipment used in the broiler enterprise was about $1,676 per producer.

The broiler enterprise consumed an average of 3.8 hours of family labor per day. Much of this labor was performed by women and children. Practically all broiler feeding in Mississippi was done by hand. Birds were sold at the farm and loading crews performed the necessary labor.

Relationship of Feed Dealers to Producers

The broiler industry is based on a close relationship between dealers and producers. In addition to serving as the source of credit for feed and supplies, dealers were also the medium through which information on disease control and other technical information was passed on to growers. Most dealers employed servicemen to visit producers for the purpose of aiding and advising them in an effort to maintain good production practices. Some dealers utilized part of their own time in this service. Feed dealers depended on various sources for their information on feeding and disease control. Feed companies ranked high in popularity as a source of information to dealers.

Dealer participation in production decisions was evidenced by the fact that 73 percent of the decisions on what type of feed to use were made by feed dealers. Dealers also decided what breed to grow in 57 percent of the cases. The decision on how many chicks to start was made by the dealer in 22 percent of the cases. When to start the brood was decided 17 percent of the time by feed dealers.

Marketing

The marketing problems are related to concentrated production areas and characteristics of broilers. Production has tended to be concentrated in rather small areas; also it is not economical to hold broilers off the market for any appreciable length of time when they are ready to be sold, although no attempt was made in this study to determine the most profitable time to sell.

Consideration of market outlets was confined to first buyers of the birds. Local processing plants received all of the broilers grown in Mississippi, except a relatively small number which were sold to trucker buyers for transfer to out-of-state markets.

Mississippi outlets purchased birds ranging from 2.5 to 3.0 pounds, while Louisiana markets utilized birds ranging from 3.0 to 3.5 pounds in weight.

As in production decisions, dealers also participated to a large degree in making marketing decisions. In 46 percent of the cases dealers decided when to sell. They also decided where to sell in 80 percent of the cases. Dealers decided what price to accept from among those offered by alternative outlets in 84 percent of the cases.

The relationship among markets tended to remain relatively constant even in a period of changing prices. Growers selling on out-of-state markets received about the same prices as those selling to local outlets.

Prices paid for Mississippi broilers tended to be relatively high for the months of March, August, and September. On the other hand they tended to be relatively low for the months of January, May and December.

Credit Factors

Broiler production is carried on almost exclusively on a short-term credit basis. Turnover is rapid, since the average growing period is about 10 weeks in duration. Dealers were not an important source of long-term credit for the construction of houses and the purchase of equipment.

Dealers reported an average of about $668 of short-term credit extended per 1,000 birds sold.

A total of $1,708,474 of credit outstanding to growers as of June 15, 1952, was reported by 48 feed dealers. These dealers had 4,763,350 broilers on feed during the week of June 15 to June 22, 1952. Some of the credit outstanding was represented by delinquent accounts.

Of the 220 producers, 37 percent utilized long-term credit to build broiler houses, and 36 percent used long-term credit to buy equipment. Only 17 percent used long-term credit to expand or improve broiler houses and to buy new equipment. The average investment in broiler houses and equipment amounted to about $303 per 1,000 bird capacity.

Many dealers obtained feed from feed companies on a 90-day credit basis. In most cases, dealers did not have to supply tangible security for credit extended by feed companies. Some dealers utilized commercial lending agencies as their credit source for financing chicks and supplies, other than feed, to the growers. These loans were usually for a 90-day period with tangible security required.

Producers, on the other hand, have depended on feed dealers as their source of credit for feed, chicks, and supplies. Producers, in general, approved of the feed dealers policy of credit extension which allowed them to obtain credit without giving tangible security other than title to the broilers.

Characteristics of the several financing plans used in Mississippi are summarized below:

Open-account plan. The dealer furnishes everything except houses and equipment. The grower raises the broilers subject to varying degrees of supervision by the feed dealer. When birds are sold, the producer receives the balance of the gross proceeds of the sale after the credit account is settled with the dealer. If the gross proceeds of sale are not sufficient to cover the credit extended on the brood, the grower is liable for the balance.

Flat-fee plan. The flat-fee plan is based on an agreement to pay the grower a fixed rate per head or per pound for broilers sold. In some cases the rate is based on the number of chicks placed. The dealer furnishes feed and supplies and takes the loss, if any occurs, on the brood. The usual rate was 5 cents per head. Some dealers split the profits with the grower on a 50-50 basis if the gross proceeds from the sale were more than enough to cover the cost of production and the flat-fee.

Feed-conversion plan. Payments to growers under this plan are determined by the ratio of the pounds of feed required to produce one pound of meat. Dealers establish a series of feed-conversion ranges and specify the amount per pound that will be paid when the feed conversion falls within the various ranges. Payments increase from one range to another as feed-conversion efficiency increases.

Salary basis. Under the salary plan the grower is paid a specific amount for birds sold or in some cases he is paid a specific amount per 1,000 birds placed. Dealers furnish houses and equipment in some cases, while in others, the growers furnish the houses and equipment.

Cash basis. All duties, responsibilities, losses or profits accrue to the grower under this plan.

Effects of Financial Structure on the Broiler Industry and General Agricultural Economy

The financial structure influences returns to producers, size and stability of the industry, producer incentives, establishment of new farm enterprises, farm income, and the allocation of resources.

Direct cost of production and returns under various plans. The cost of production varied widely among different plans. Total direct cost per pound of broiler, on a weighted average basis for the period studied, was 25.8 cents under open-account, 29.2 cents under flat-fee, and 23.9 cents under the cash basis. Prior to any deduction for depreciation and interest on investment, or labor, open-account growers received a weighted average return of 1.0 cents per pound of broiler sold as compared to 2.26 cents for flat-fee growers and 3.3 cents for cash growers.

Effects of financial structure on the broiler industry. It is apparent that availability of production credit has not been a limiting factor in expanding the total volume of broiler production in Mississippi. There seems to be a relatively high degree of competition among feed dealers to secure the patronage of growers.

The producer incentive for efficient production was much greater where the returns to the grower were directly related to the feed conversion he obtained on a brood. Open-account, cash, and feed-conversion plans offered the greatest incentives while salary and flat-fee plans offered little incentive except in those cases where the dealer agreed to share the profit with the grower. Because of relatively low broiler prices, open-account producers were becoming more dissatisfied with their returns as compared to returns under the flat-fee and feed-conversion plans.

Farm family income has been increased in many cases by establishment of the broiler enterprise. This has worked to the particular advantage of those families which have surplus labor that cannot be readily utilized through other sources.

The ease with which production credit could be obtained and the need for supplementing income have been influential in causing many farmers to allocate a part of their resources to broiler production.

The financing of the broiler industry grew around the fact that the industry developed almost entirely as a side-line business with growers. At the time of this study, there were indications that only flat-fee and cash growers receive enough returns to permit expansion of the industry if they were wholly dependent on it for their income and devoted full time to broiler production.

The financial structure of the industry has resulted in higher credit charges than might have been necessary otherwise. To the extent that dealers are interested in the composite results of their broiler financing operations they have considerable latitude in establishing their credit policies. It is conceivable that their books may show appreciable losses on some broods and large profits on others. However, the higher price charged for feed under the flat-fee tends to magnify the actual loss on the brood, if loss occurs, since the dealer pays the same price for the feed he furnishes different growers under different plans. Flat-fee growers, although generally less efficient, received higher returns on the average than the more efficient open-account producers.

Assuming no large amount of bad accounts, the feed dealers realized more gross returns where they operated wholly on an open-account basis, especially when the margin between cost of production and the price of broilers was as small as it was during the period studied. This assumed that they would be able to collect from open-account growers if loss occurred. Feed and supplies can be obtained by the dealer for the same outlay regardless of what type of plan he uses to finance growers. Birds are sold at market prices regardless of the type of plan under which they are raised.

The average amount paid the grower under open-account was 1.0 cents per pound, as compared to 2.26 cents per pound under the flat-fee. Obviously, the grower took less return from open-account operations and was in essence paying a higher price for feed and supplies. Growers, on the other hand, found it difficult to determine what they were being charged for credit. Cash prices varied among dealers for different kinds of feed. An increase or decrease in the credit price may or may not be a reflection of a change in the price of feed purchased by the dealer. It appears that, if the price of broilers remain at about the present level or falls, a reduction in the price of feed will be necessary if dealers desire to keep their growers operating on an open-account basis.

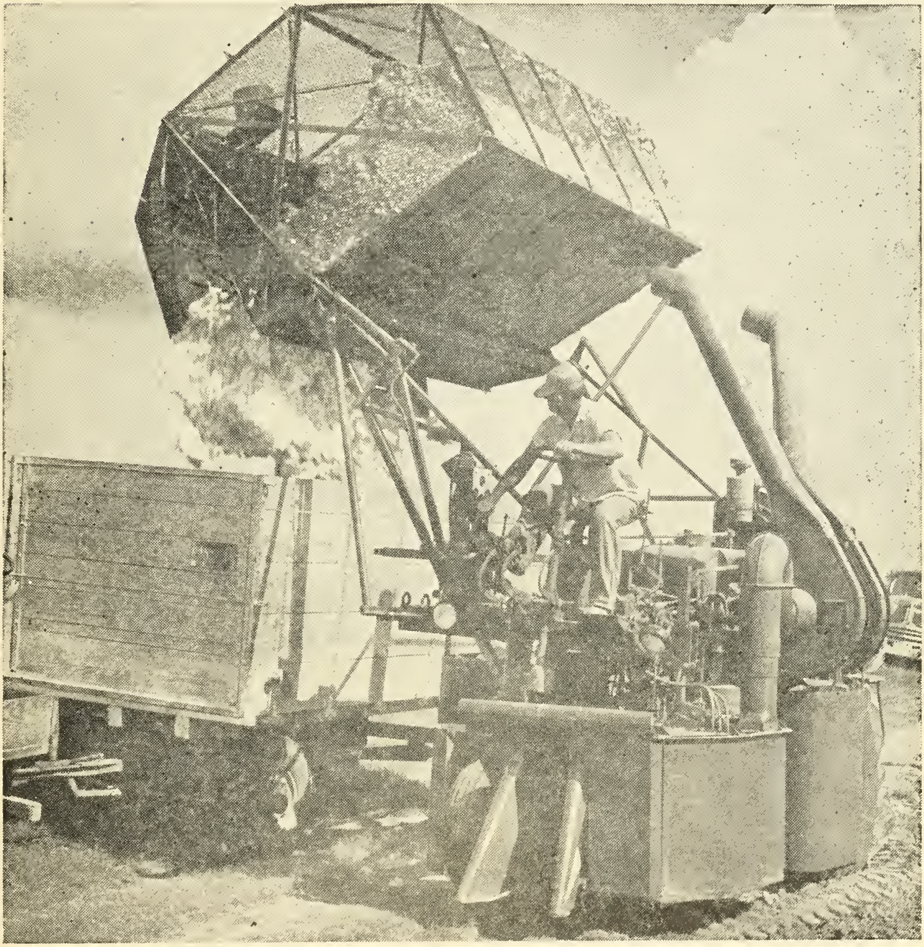
The broiler industry seems to carry a high potential value where there is need for an intensive enterprise to utilize surplus labor. With some adjustment in the credit charge and adoption of more standardized policies to regulate the relationship between dealer and grower, the industry would probably offer an excellent opportunity to growers.

It is necessary to provide some production incentive if growers are to be encouraged to produce efficiently. Probably the most effective measure that could be utilized toward this end would be the exclusive use of financial plans which make the returns to the producer dependent on the feed conversion obtained. Some price differential based on the quality of birds produced would also serve as a valuable incentive.

no. 515

BULLETIN 515 APRIL 1954

FACTORS AFFECTING THE EFFICIENCY OF
Mechanical Cotton Pickers
IN THE YAZOO-MISSISSIPPI DELTA



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ON COVER: Unloading the hydraulically operated picker basket into a two-bale trailer. The basket has a capacity of approximately 1,000 pounds of seed cotton.

FACTORS AFFECTING THE EFFICIENCY OF MECHANICAL COTTON PICKERS IN THE YAZOO-MISSISSIPPI DELTA

By E. B. Williamson, O. B. Wooten, Jr., and F. E. Fulgham[1]

The advent of cotton-harvesting machines has brought new problems to the producer as well as to the processor and user of raw cotton. While the ginner has been busy with the excessive moisture, increased trash content, and tangled fibers in machine-picked cotton, the farmer has worked toward better management of pre-harvest practices, which together with machine performance, ultimately determine the amount and quality of cotton that will be harvested. The most serious charges against machine picking have been (1) excessive field losses and (2) reduction in quality.

Cotton-production practices changed very little as long as hand methods were used exclusively in harvesting. It was often said that a family could produce more cotton than it could pick. Since the efficiency of the hand picker was rarely affected by row length, plant spacing, grassy fields, uniform opening, and certain other factors, there was little incentive for pre-harvest improvements. With the inception of mechanical pickers, however, it has been necessary to reconsider various production and harvesting techniques.

Early Investigations

Certain production methods have received attention from investigators for many years. It was quite obvious that problems such as breeding cotton varieties adaptable to mechanical harvesting could not be solved overnight. Farmers, research specialists, and industry have all been working vigorously, however, to improve the various practices that affect mechanical picking.

Factors Affecting Performance

The influence of the following factors on picker performance will be discussed: Varieties, field layout and water control, stalk disposal and seedbed preparation, seed preparation and planting, weed and grass control, insect control, defoliation, and machine performance. Yield is a vital factor in good machine performance.

Varieties

When the plant breeder was confronted with the problem of breeding a variety of cotton suitable for mechanical picking, there were no well defined specifications available to assist him in the assignment. He also was aware that if an ideal cotton for mechanical harvesting were developed, that environmental factors, such as soil type, rainfall, and climate, would alter the characteristics of the plant when grown in different areas. He realized, too, that early commercial machines would be modified and that new types of pickers with entirely different picking principles might eventually be perfected. Therefore, the cotton breeder has proceeded cautiously before going "all out" for "tailor-made" varieties. Intensive breeding for desirable harvesting traits will be practicable only when machine development becomes stabilized.

Field tests have been conducted in several locations across the Cotton Belt to determine the varietal characteristics that are desirable for mechanical production and harvesting. Early tests conducted at the Delta Branch Experiment Station were modified after the introduction of defoliants and other modern production practices. Further investigations revealed

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[1] Agricultural Engineers, Farm Machinery Section, Agricultural Research Branch, Agricultural Research Service, United States Department of Agriculture, and the Delta Branch of the Mississippi Agricultural Experiment Station cooperating.

This report was prepared as a portion of a study supported in part by funds appropriated under authorization of the Research and Marketing Act.

that plant characteristics, such as height of first fruiting branch, length of limb, and maturity date, could be controlled to a limited extent by factors such as spacing, plants per acre, and flaming.

Additional studies conducted in the Mississippi Delta showed that the picking efficiency of varieties differed significantly between tests and between years. The differences apparently resulted from such things as machine operation, field location, and weather. No decided advantages in pickability or cleanability were determined for any of the commercial varieties adapted to the Delta area (Table 1).[2]

In developing a cotton for mechanical harvesting, many factors have been considered. An ideal plant would be of medium size with relatively short limbs, short fruiting nodes, medium-light foliage, and lower branches well off the ground. It would include, in addition, such desirable features as reduced foliage pubescence, or leaf hairiness; modified boll bracts; medium size, well-opened "straight bur" bolls; and a plant of medium early maturity that tends to shed its leaves when fruiting is complete. Plant breeders are continually working to select strains that have good seedling vigor, since these lines get off to better starts and give better yields. Good yield is a prerequisite for high picking efficiency.

Field Layout and Water Control

The importance of field layout should not be overlooked in planning for mechanical cotton harvesting. Fields should be arranged so that short rows will be eliminated at every opportunity so that "turning time" will be reduced to a minimum.

Turn alleys should be wide enough to facilitate rapid turning of the machines, and road or alley ditches should be smooth and shallow to reduce the vertical movement of the picking unit as it enters the row. Unless ample turning space is provided, it will be necessary to pick the ends of the rows by hand to get maximum recovery of the cotton.

In some fields it will be advantageous to relocate roads, ditches, fences, and possibly buildings. Careful planning and preparation of land adaptable to cotton production will usually pay big dividends. Row direction is also a vital factor in designing drainage or water-control systems where mechanical farming will be practiced.

Table 1. Picking efficiency of 11 commercial varieties of cotton in mechanized cotton variety trials conducted at the Delta Branch Experiment Station, 1948-1951.

	Picking efficiency					
	1948		1949		1950	1951
Variety	Test A	B	A	K	A	K
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Bobshaw 1[1]	93	96	94	87	90	90
Coker 100 Staple	89	96	93	87		
Coker 100 Wilt	90	95	92	90	88	92
Delfos 651 DES	91	95	93	86	---	90
Delfos 9169	89	96	94	88	85	94
Deltapine 15	89	93	92	85	87	90
D & P L-Fox	----	----	----	90	90	91
Empire	86	93	91	86	87	88
Stoneville 2B	92	94	93	87	86	88
Miller	80	91	90	88	—	—
Wilds	89	95	94	86	---	—

[1] Bobshaw in 1948 and 1949, Bobshaw 1A in 1950 and 1951.

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[2] "Cotton Varieties Compared Under Mechanical Practices." **Mississippi Farm Research, pp. 2,** April 1952.

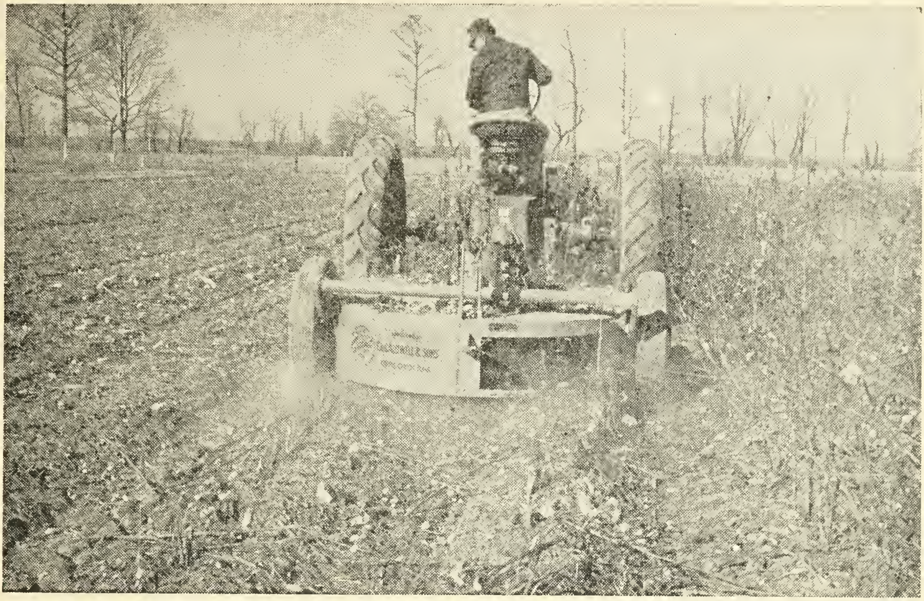


Figure 1. A power-driven horizontal blade type stalk shredder operating in rank cotton stalks.

The elimination of low spots, pockets, and other surface irregularities will improve the efficiency of all production practices, including the operation of the mechanical picker. When available, dirt-moving equipment such as scrapers, dozers, and land levelers will facilitate the removal of many of these trouble spots, although occasionally they can be corrected by careful plowing in the affected area. Underground outlets may also be feasible occasionally in eliminating a serious drainage problem. In addition to providing better picking conditions during the harvesting season, improved drainage promotes uniform plant growth and boll maturity.

Stalk Disposal and Seedbed Preparation

Although mechanical harvesting is rarely affected directly by old crop residues, it is imperative to effectively destroy all vegetative material before using mechanical production techniques. Poor stalk disposal may seriously interfere with planting and cultivation, especially when pre- and post-emergence chemicals are applied. The introduction of modern power-driven stalk shredders has greatly improved methods of crop-residue disposal (Figure 1). By shredding stalks into small pieces immediately after harvesting, better coverage is possible in plowing operations, and more thorough disintegration is obtained before the next crop is planted. Chokage of planters and cultivators from undecayed stalks and other vegetative debris usually results in broken stands, which in turn reduces harvesting efficiency.

Tests have shown that seedbed preparation often plays a prominent role in the kind of stand obtained and the quantity of cotton harvested. In recent studies at the Delta Branch Station, both stand and yield were improved by deep tillage (Table 2).

When land is prepared by bedding, it is especially important to maintain uniform row spacing as well as proper bed shape (Figure 2). Since the picking unit of a mechanical picker is gauged by the large tractor vehicle wheels, it is easy to

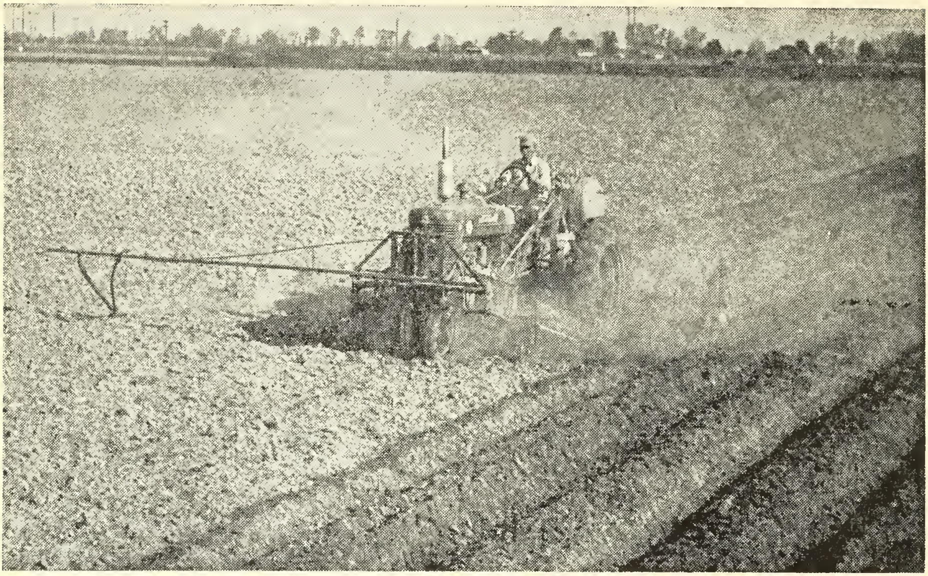


Figure 2. Applying anhydrous ammonia and bedding four complete rows in one trip across the field. Note the uniform, evenly spaced beds and the balanced arrangement of equipment on the tractor.

see the uneven effects of alternately low and high middles as the picker moves from one row to another. The use of a carefully adjusted marker on the bedding implement will also facilitate the forming of evenly-spaced beds. The elimination of "guess" rows is also important, especially when runner-wing equipped planters are used. For maximum uniformity, it is essential for the soil in the top of the beds to be swept evenly to each row middle.

Seed Preparation and Planting

Most farmers recognize the advantages of properly delinting and treating cottonseed. Delinted seed germinate quicker and are better adapted to precision planting. On the other hand, a fuzzy-coated seed is better prepared to withstand adverse soil conditions when germination is delayed. It is therefore desirable to retain at least a part of the fiber coat on seed planted in the Mississippi Delta area Seed treatment is especially important, since it often saves valuable seed and time and may possibly prevent later field epidemics of certain diseases.

The planting operation is of primary importance in cotton production. Uniform stands of healthy plants are invaluable in minimizing grass and weed problems, attaining high yields, and provid

Table 2. The effect of four tillage treatments on stand and yield on Dundee silt loam at the Delta Branch Experiment Station, 1953.

Tillage treatment[1]	Plants per acre	Seed cotton per acre
	Number	Pounds
Middlebreaker	25,973	1949
Chisel, 12-inch centers	28,918	2799
Disc plow	31,962	2853
Moldboard subsoil plow	31,745	2931

[1] The preparation of all plots except the middlebreaker were approximately 12 inches deep.

ing an even flow of cotton in the picking operation.

A cultivator-planter method of planting developed and first employed at the Delta Branch Experiment Station in 1946 has been adopted by farmers throughout the area. Advantages of the system include (1) the saving of labor and equipment by eliminating many of the usual disking and harrowing operations prior to planting and (2) the preservation of soil moisture, which is a vital factor in obtaining stands during dry periods. Best results are obtained when the soil has been bedded or broken a few weeks ahead of planting and allowed to settle. This method of planting has not been highly adaptable to the heavy clay or "buckshot" soils of the Delta.

The equipment necessary for this operation consists of a tractor equipped with a front-mounted cultivator and a rear-mounted planter, complete with sword openers and runner wings. The regular cultivator sweeps, operating ahead of the planting equipment, loosen the beds or soil sufficiently to permit the planter wing blades to sweep the remaining soil layer to the middles. Under favorable conditions, many partially germinated

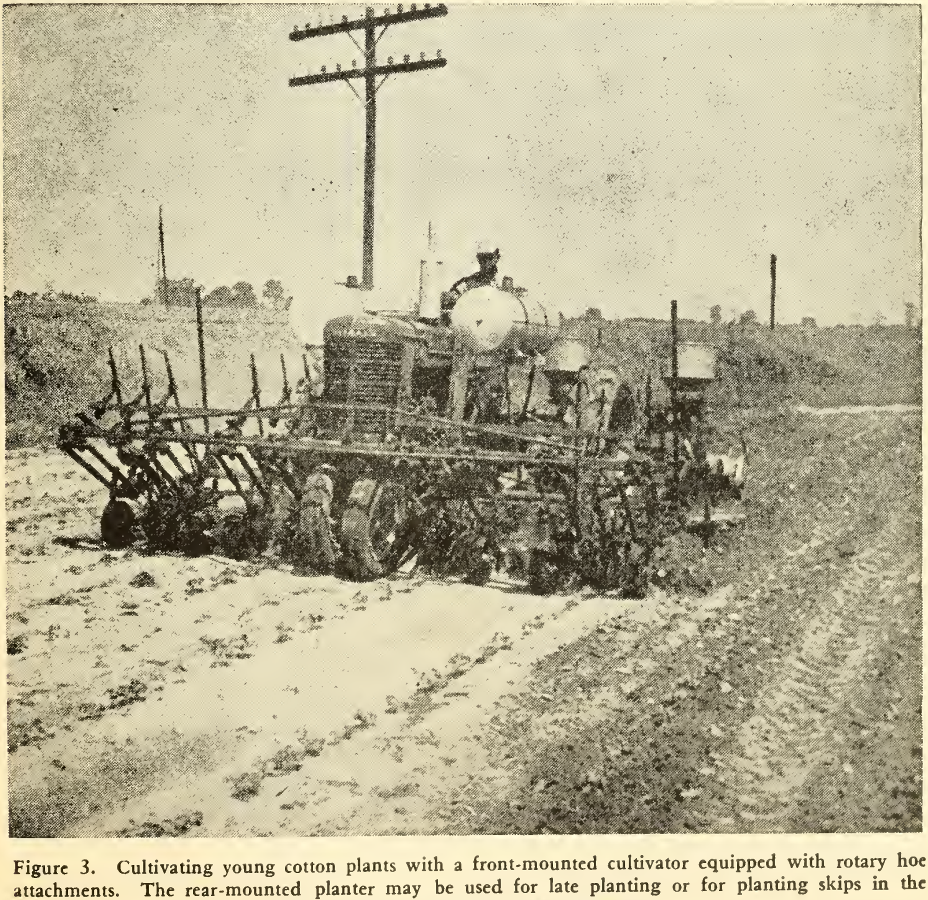


Figure 3. Cultivating young cotton plants with a front-mounted cultivator equipped with rotary hoe attachments. The rear-mounted planter may be used for late planting or for planting skips in the field without changes in the equipment.

weed and grass seed in the warm top layer of the soil are swept out of the drill area into the middles. Another beneficial feature of the planter-cultivator combination is the balanced arrangement of equipment on the tractor, which eases the steering operation for the driver. Still another advantage is the ability to perform both planting and early cultivation operations with the same tractor (Figure 3).

Early investigations indicated that plant spacing and population directly affected mechanical harvester performance. Studies at the Delta Station have shown that under certain conditions closely spaced, uniform stands are more favorable to the efficient operation of cotton pickers than plants in widely spaced hills (Table 3). It should be pointed out that stands in the 40-inch, cross-plowed cotton averaged approximately 20,000 plants per acre for the 4-year period. These relatively low plant populations were instrumental in producing large stalks with long spreading limbs that unfavorably affected picking efficiencies in this treatment.

Results of a stand and harvesting study initiated at the Delta Station in 1952 show that high picking efficiency is also closely associated with high yield (Table 4). Dry weather wilted cotton severely in the first year of the test and both yield and picking efficiency were adversely affected. It is interesting to note that the yield and picking efficiency of the widely spaced, 40-inch cross-plowed cotton compared favorably with the other five spacing treatments for both years. These data also revealed that thick stands of heavily drilled, unthinned cotton produced a greater percentage of small bolls, which tended to open prematurely. Although a long dry period was experienced again the second year, deep breaking practices in the test area stimulated higher yields and resultingly better picking efficiencies.

Weed and Grass Control

Although weed control has consistently been one of the most expensive operations in cotton production, the problem has been emphasized even more since the introduction of the mechanical picker. It is particularly essential to rid fields of weeds and grass before cotton is picked mechanically.

Various methods of cultivation are employed by farmers, often within the same general area. In working toward ideal harvesting conditions, however, certain desirable production techniques should be followed as closely as possible. When uniform beds or rows are maintained through planting and emergence, cultivation methods should thereafter continue to preserve uniformity until harvest time (Figure 4).

The standard practice of continually piling soil around the cotton plants to cover grass and weeds is incompatible with modern weed control methods. It also raises the tops of rows nearer to bottom limbs of the cotton plants, which brings the mechanical picker in closer contact with the soil. Excessive wear is then experienced on the lower spindles of the picking unit, and additional trash or

Table 3. The effect of four methods of thinning cotton on the picking efficiency of a high-drum International Harvester picker at the Delta Branch Experiment Station, 1948-1950 and 1953.[1]

Thinning method	Spacing	Percent picking efficiency				
		1948	1949	1950	1953	Avg.
Hand chopped	12-inch centers	91.1	94.1	94.7	----	93.3
Hill dropped	16-inch centers	89.9	93.3	94.5	----	92.5
Cross-plowed	24-inch centers	----	----	93.8	92.7	93.3
Cross-plowed	40-inch centers	86.1	89.6	89.3	92.2	89.3

[1] The 24-inch cross-plowed treatment was added to the experiment in 1950. Poor stands in 1951 and 1952 resulted in insufficient data for these 2 years.

Table 4. The effect of six spacing treatments on stand, pounds of seed cotton, and percent picking efficiency at the Delta Branch Experiment Station 1952-1953.

Thinning method	Spacing	1952			1953		
		Plants per acre	Yield	Picking efficiency[1]	Plants per acre	Yield	Picking efficiency
		Number	Pounds	Percent	Number	Pounds	Percent
No thinning	Heavy drill[2]	84,824	958	77.1	68,607	2615	88.0
No thinning	Light drill[3]	54,110	1341	81.7	41,622	2854	91.5
Hill dropped	14-inch centers	46,660	1227	76.7	50,578	3093	92.0
Hill dropped	20-inch centers	42,869	1178	79.0	45,869	2856	91.5
Cross-plowed	24-inch centers	45,092	1649	84.2	51,423	2986	92.7
Cross-plowed	40-inch centers	32,283	1510	80.1	39,858	3100	92.2

[1] International Harvester, high-drum picker.

[2] Drilled 40 pounds seed per acre.

[3] Drilled 20 pounds seed per acre.

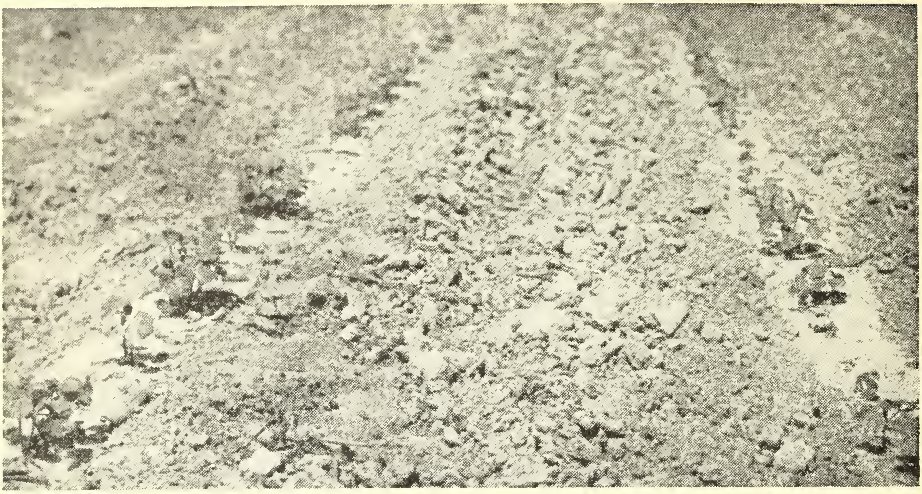


Figure 4. A stand of hill dropped cotton after the first cultivation with high speed sweeps. Note the low row profile, which is highly desirable for the application of herbicides and flames.

other debris is picked up and mixed with the cotton.

The use of flat, properly set high-speed sweeps and crop shields will greatly reduce the problem of high bed formation. Rotary hoe attachments have proved highly effective as shielding devices and under early soil crusting conditions have continued to aid in obtaining stands and eradication of small grass and weeds. Both herbicides and flame cultivation are used to a limited extent in weed control programs in the Delta area (Figure 5). Flaming, which has proved feasible for midseason control, has also been used effectively in eradicating weeds and grasses late in the season. Cross-plowing has proved to be one of the most economical methods of weed control in the area, although slightly lower picking efficiencies have been obtained under certain conditions. This disadvantage can virtually be eliminated by leaving wider hills and a greater number of plants.

Insect Control

The introduction of new insecticides and early control methods has greatly contributed to increased yields. Early insect control materially assists young plants in "getting off" to a better start and assures the productiion of an early crop. Insects invading cotton fields late in the season often cause trouble for the mechanical picker in the form of honeydew, faulty bolls and shredding foliage.

The increased use of insecticides has been stimulated by the development and widespread use of ground spraying and dusting methods. The practice of applying insecticides simultaneously with cultivation generally reduces the cost of application (Figure 6). Farmers who have wholeheartedly followed a well planned insect control program have found that it usually pays large dividends.

Methods of application have included the use of various types of airborne and ground equipment. In early studies at the Delta Station a high clearance vehicle was provided for dusting and spraying in rank cotton by removing the picking unit and storage basket from a cotton picker tractor and properly shielding each wheel (Figure 7).

Defoliation

The effect of chemical defoliation on mechanical harvesting has been investigated since the first pickers began operating. Results have not conclusively shown that defoliation is economically feasible under all conditions. There have been numerous benefits derived from defoliation however, and several million acres of cotton are defoliated annually.

Tests determining the effect of defoliation on quality and picking efficiency have been conducted at the Delta Station since 1944 (Table 5). Although slight increases have been indicated for both quality and picking efficiency, modern cleaning and ginning methods have largely solved the problem of high trash content. Since green leaves tend to leave objectionable stains in the cotton lint, the

Table 5. **Foreign matter content, grade and picking efficiency of defoliated and undefoliated cotton, Stoneville, Mississippi, 1944-1953.**

Year	Seed cotton Foreign matter content		Lint grade		Picking efficiency	
	Defoliated	Undefoliated	Defoliated	Undefoliated	Defoliated	Undefoliated
	Percent	Percent	Index	Index	Percent	Percent
1944	5.9	6.5	77.5	73.0	78.6	76.8
1945	4.6	4.7	88.0	85.0		
1946	5.4	8.8	89.5	86.5	91.8	91.8
1947	6.2	8.5	86.2	83.3		
1948			89.7	88.0	90.2	87.4
1949			86.3	86.7	92.8	93.3
1950	8.1	7.5	91.2	88.4	93.4	92.7
1952	6.1	6.3	100.0	97.0	81.7	77.9
1953	7.0	8.4	99.3	100.7	91.5	91.2
Mean	6.2	7.2	89.7	87.6	88.6	87.3

Defoliated with Aero Cynamid, special grade 1944-50; Magnesium Chlorate, 1952-53.

Grade index: 104 Strict Middling, 100 Middling, 94 Strict Low Middling, 85 Low Middling, 78 Strict Good Ordinary, 70 Good Ordinary.

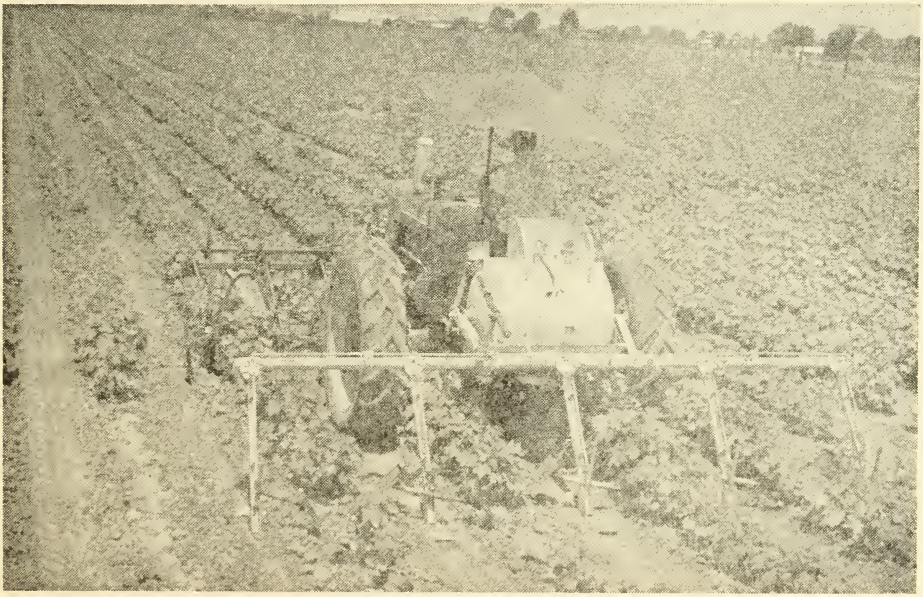


Figure 5. Mid-season cultivation of cotton with high-speed sweeps and flat type flame burners. The beds are kept flat to improve flame and mechanical picker performance.

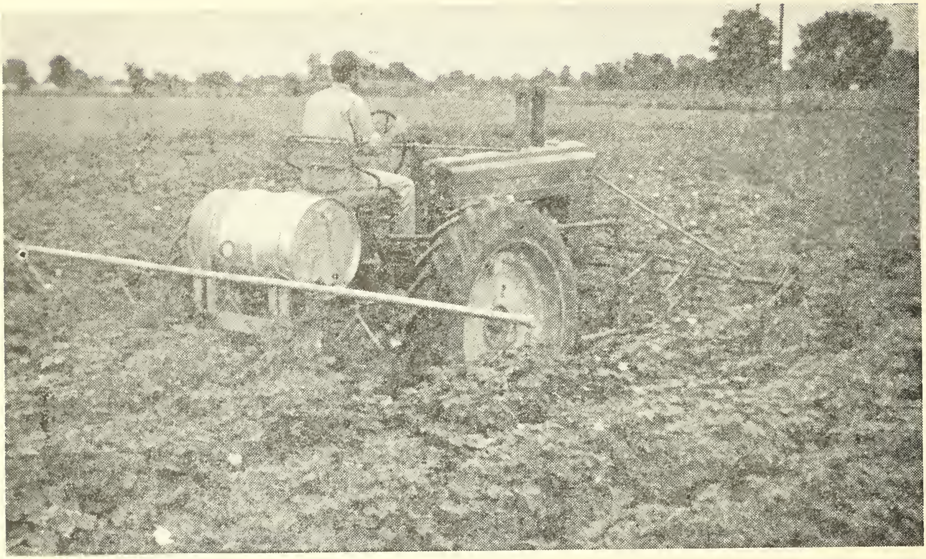


Figure 6. Cultivating and spraying cotton in one operation to reduce the number of trips through the field. Good insect control favors high yield and picking efficiency.

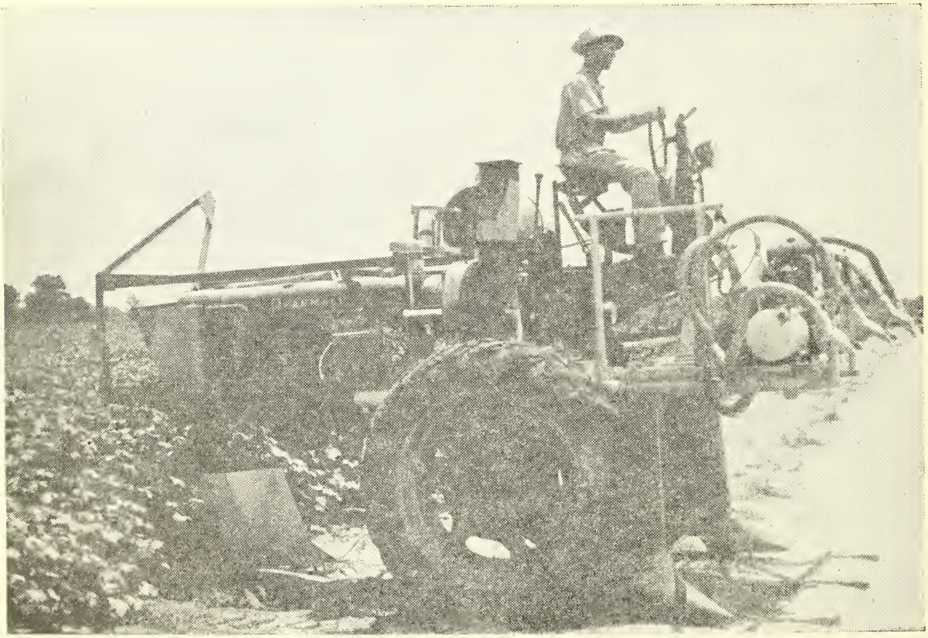


Figure 7. A cotton picker tractor equipped with a duster and wheel shields for the application of insecticides in rank cotton.

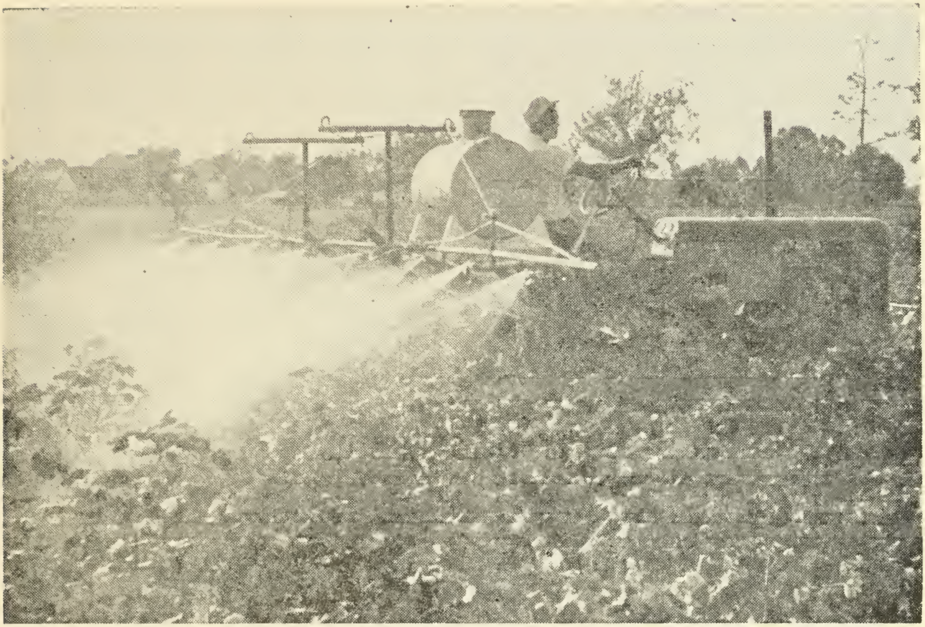


Figure 8. Applying a liquid defoliant with an eight-row tractor-mounted sprayer. Wide booms and tractor shields are essential to reduce plant damage by the machine.

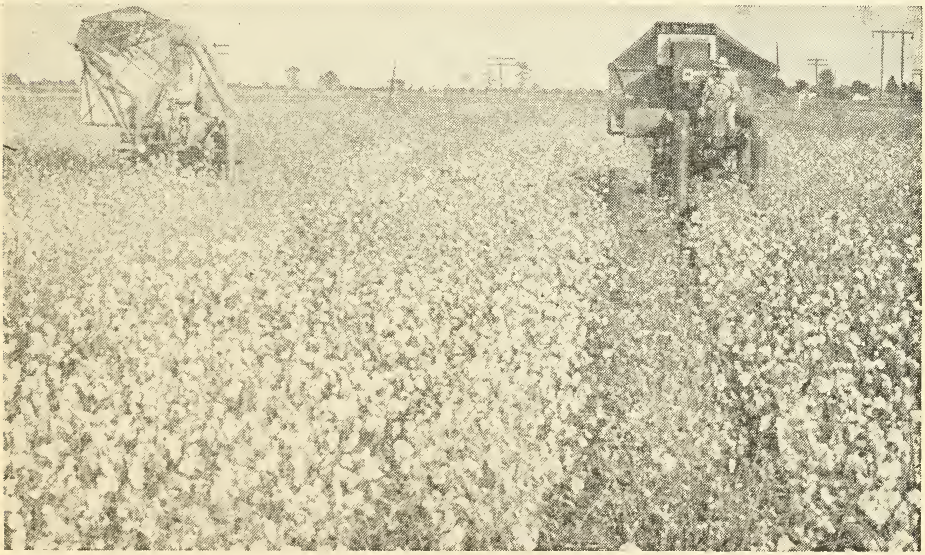


Figure 9. Two types of mechanical pickers operating in a field of well defoliated cotton. Tests have shown that picking efficiency is improved by high yields.

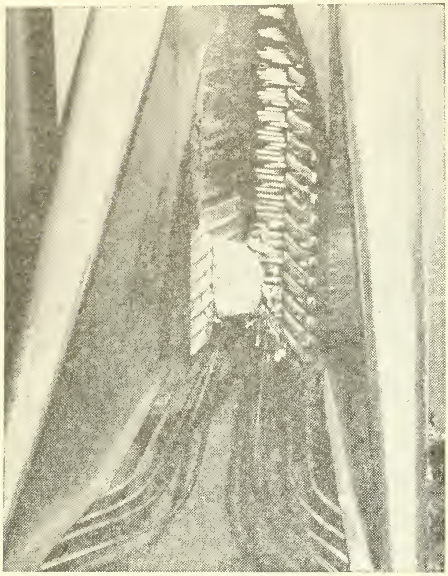


Figure 10. This small chunk of concrete, which lodged between the spindles and the pressure plates of the machine, resulted in the loss of 12 spindles, 3 doffers and ½ day's picking time.

practice of defoliating will no doubt continue to be a vital factor in mechanical picker performance.

Airplanes have been used extensively for applying defoliants, but recent improvements in ground machines indicate that airplane application can be duplicated in many areas (Figure 8).

Machine Performance

There are several machines on the market that will pick cotton. Although there are certain differences in design they are all relatively expensive machinery, containing many precision parts. To function properly they must be adjusted, operated and maintained with the same care that any complex piece of equipment should receive.

The importance of understanding thoroughly the operation of your machine cannot be overemphasized. A poor job of picking can often be traced to improper care and adjustment. Before entering the field the operator should be sure that the picking mechanism of his machine is in the best possible condition. It costs no more to pick all of the cotton in the field than to pick only a part of it.

All manufacturers of cotton pickers furnish operators manuals that show proper adjustments, lubrication and other service information. Following the service instuctions outlined in these manuals will pay big dividends in better quality picking and less time charged to repairs. After the machine is set to do the best picking job for a particular field, it is then up to the operator to keep the picker performing at top efficiency. Remember, however, that the operator's job can be made easier by employing good production practices that result in high yields of clean open cotton (Figure 9).

Special attention should be given to the condition of the fields that will be harvested mechanically. The time used in removing bricks, scrap iron, stumps and other debris from fields will pay large profits. Even after fiields have been checked and cleaned the picker operator must be alert to the constant danger of ground obstructions and other foreign materials. The passage of a hard object through the picking unit usually results in considerable damage to vital parts, as well as loss of valuable time (Figure 10).

Tests that have been conducted to determine the value of adding wetting agents to water for moistening picker spindles have not conclusively shown increase in picking efficiencies, especially when naturally soft water was available. On the other hand, it has been found that agents often assist in preventing a buildup of "honeydew" and plant juices on the spindles, which therefore warrants their use in certain areas.

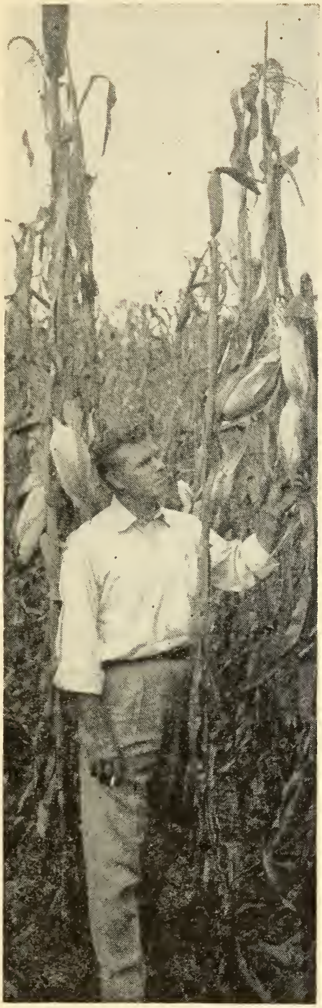
Good pre-harvest practices coupled with intelligent use of the mechanical picker produce results that will be profitable.

ACKNOWLEDGEMENT

Acknowledgement is made to J. B. Dick and H. R. Carns and staffs, Section of Cotton and Other Fiber Crops, Field Crops Research Branch, USDA, and Delta Branch of the Mississippi Agricultural Experiment Station, who cooperated in the work on varieties and defoliation, respectively. Acknowledgement is also made to P. H. Grissom, Department of Soil Fertility, Delta Branch of the Mississippi Agricultural Experiment Station, and Dr. William A. Raney, of the Experiment Station at State College, who cooperated in the deep tillage studies. The authors also express appreciation to Dr. W. L. Giles, Superintendent of the Delta Branch Experiment Station for assistance given in the mechanization studies and acknowledge that the late W. E. Meek, formerly head of cotton mechanization research for the Cotton Belt, played a prominent role in the development of the cultivator-planter planting method mentioned in this publication.

no. 516

APRIL 1954 BULLETIN 516



Order in Yields from

FERTILIZER AND SPACING IN CORN PRODUCTION

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ORDER IN YIELDS FROM FERTILIZER AND SPACING IN CORN PRODUCTION

By O. T. OSGOOD, Department of Agricultural Economics

A study of corn yields over a wide range in soils, seasons, planting rates, and fertilizer treatments, on farms in the Upland areas of Mississippi during the last five years, has revealed a remarkably uniform order or pattern in yields. In fact, the order has been found to be so uniform and definite that each established yield for a balanced treatment of number of plants and amounts of fertilizers per acre actually indicates what other yields are for the same production conditions. This is because of the position of the yield for each treatment in relation to yields for other treatments in the natural order running through the whole system. It is true even though the order changes gradually with the amount of production per acre.

The order is a series of curves like the shucks around a nubbin, from the smallest and thinnest next to the grain to the largest and coarsest that is often left on the stalk at gathering time. They can be understood best by corn growers who have worked with nature by plowing their furrows and running their rows with the terraces or on contours around hillsides which slope gradually down to some really good corn land.

For the farmers, these results mean that, from the yields they have been making with any balanced treatment of number of plants and amounts of fertilizers per acre, they can see approximately what the yields would be for more plants and fertilizers or for a wider spacing of plants and less fertilizers, for the same soils, weather, and other production conditions. That should reduce these problems to simple arithmetic, high finance, and weather prediction. The general idea of the story is summarized in the three pictures in Figures 1, 2, and 3.

For researchers, the discovery simplifies their present problems by elimination of the necessity for more than one rate of corn planting in their tests in many instances. (Yields for other rates, with treatments in proportion, can be calculated from yields for the one rate used. They can be approximated closely enough for practical purposes even when the treatments are slightly off balance, if available information on the influence of each plantfood element is used.) Other developments that came as a part of the discovery being reported also make possible a reduction in the number of rates of the various other treatments being tested. As a result, researchers will be able to move faster in dealing with their present problems, and begin or expand on others, some of which should now be less difficult. And, in addition to direct effects on research with corn, researchers in other fields of agriculture may find these results applicable in their fields as well.

Research developments presented in this report were made in the process of finding the best paying land uses and treatments in determining suitable farming systems for farms in the different kind-of-land and size-of-farm groups set out in Mississippi Experiment Station Technical Bulletin 32, "The Land Use Pattern Scale Method of Land and Farm Classification." The data on corn yields, on which the findings are based, were collected on special study test-demonstration farms in Alcorn, Itawamba, Prentiss and Tishomingo Counties, under farm conditions that did not include irrigation. The work is carried on in cooperation between Mississippi State College and the Tennnessee Valley Authority. It was established in Mississippi under sponsorship of the Tennessee Valley States Correlating Committee as a pilot study from which developments applicable in adjoining areas might spread to other states of the Tennessee Valley and to other parts of the country. The American Potash Institute assisted by providing muriate of potash for use on the special study farms, and the Mathieson Chemical Corporation assisted by providing high analysis fertilizers for use on one of the twelve farms in 1953.

Data from other areas of the state which confirm the findings in the Tennessee Valley area, were developed at the Holly Springs, Pontotoc, and Coastal Plain Branch Experiment Station, and at the Central Station at State College. The data from the branch stations are used in this report through the courtesy of Dr. H. B. Vanderford of the Department of Agronomy and Soils and the Branch Station Superintendents. Data from the Central Station were computed by the author from yields furnished by Mr. Howard V. Jordan of the Department of Agronomy annd Soils and the United States Department of Agriculture.

After determining the variation in yield responses under farm conditions according to kind of land, as reported in the above mentioned bulletin, the next step in development of data on yields was through use of a series of widely different balanced treatments on a number of widely different soils which were classified in relation to each other.[1]

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[1] The following assistance is acknowledged: Dr. H. B. Vanderford in classification of soils and location of tests, Mr. Howard V. Jordan in selection of balanced treatments for use in tests. Dr. R. C Eckhardt of the Department of Agronomy and Soils and the United States Department of Agriculture in selection of adapted hybrids for use in the tests, Dr. W. F. Drapala in selection of the design for experimental plots used in 1952 and 1953, Dr. Arthur Ollivier, Head of the Mathematics Department, Dr. H. C. Thomas of the Physics Department, Mr. Cecil Marion of the Engineering Department, for assistance in mathematics; and for developing the author's original formula into a general equation, to Mr. J. H. Christensen, Principal Chemist, of the Tennessee Valley Authority.

Figure 1. The wider spacings and lighter fertilizer treatments paid best on the dry, shallow soils (T. C. Pounders farm, Tishomingo County, October 21, 1953.

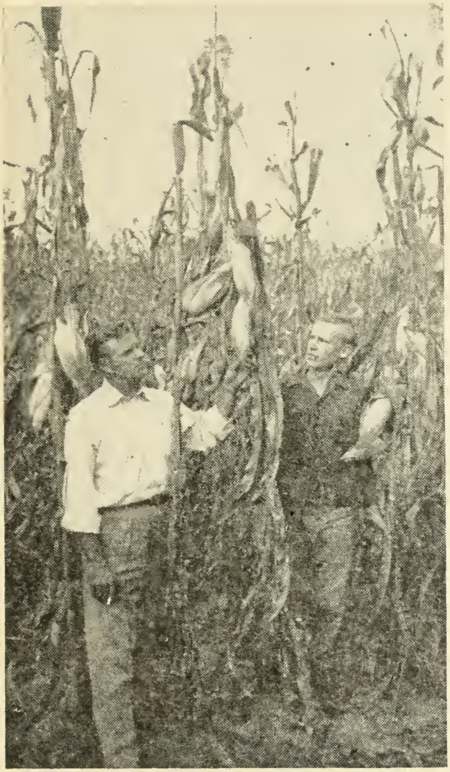


Figure 2. The thicker spacings and heavier fertilizer treatments paid best on the better corn soils, (E. E. Richardson farm, Alcorn County, October 20, 1953.)

Yields from both replicated plot tests and fields were recorded by soils and treatments.

Generalized results under good production conditions during the five-year period may be seen in Figure 4 for three of the treatments used, each according to kind of land. The three treatments are each identified by number of plants and number of pounds of nitrogen, phosphorus, and potash per acre. The fertilizers in the three treatments cost about $14, $21, and $28 per acre.

The treatment that cost the most made the most corn and the most dollars above fertilizer costs on the best corn soils under best production conditions. But it made the least corn, and the poorest quality of corn, on the poorest soils and under the poorest production conditions. The treatment that cost the least and made the least on the best corn soils made the most corn on the poorest soils and under the poorest production conditions. It may be noted, however, from the lines near the left edge of the chart, for soils where excessive moisture is the major limiting factor, that the heaviest treatment with the thickest spacing made corn on land that was too wet for the lighter treatments and wider spacings and, in contrast with results on all other soils, made higher yields at the low yield levels. Yields for the average of these three treatments ranged from about 100 bushels down to nothing, according to the kind of land.

The soils groups are indicated in Figure 4. The soil group numbers in con-

Figure 3. Thickest spacings and heaviest treatments paid best on the best corn soils under best production conditions, which included irrigation on this field (J. A. Coker special study test demonstration farm, Tishomingo County, October 22, 1953.) See text for results without irrigation.

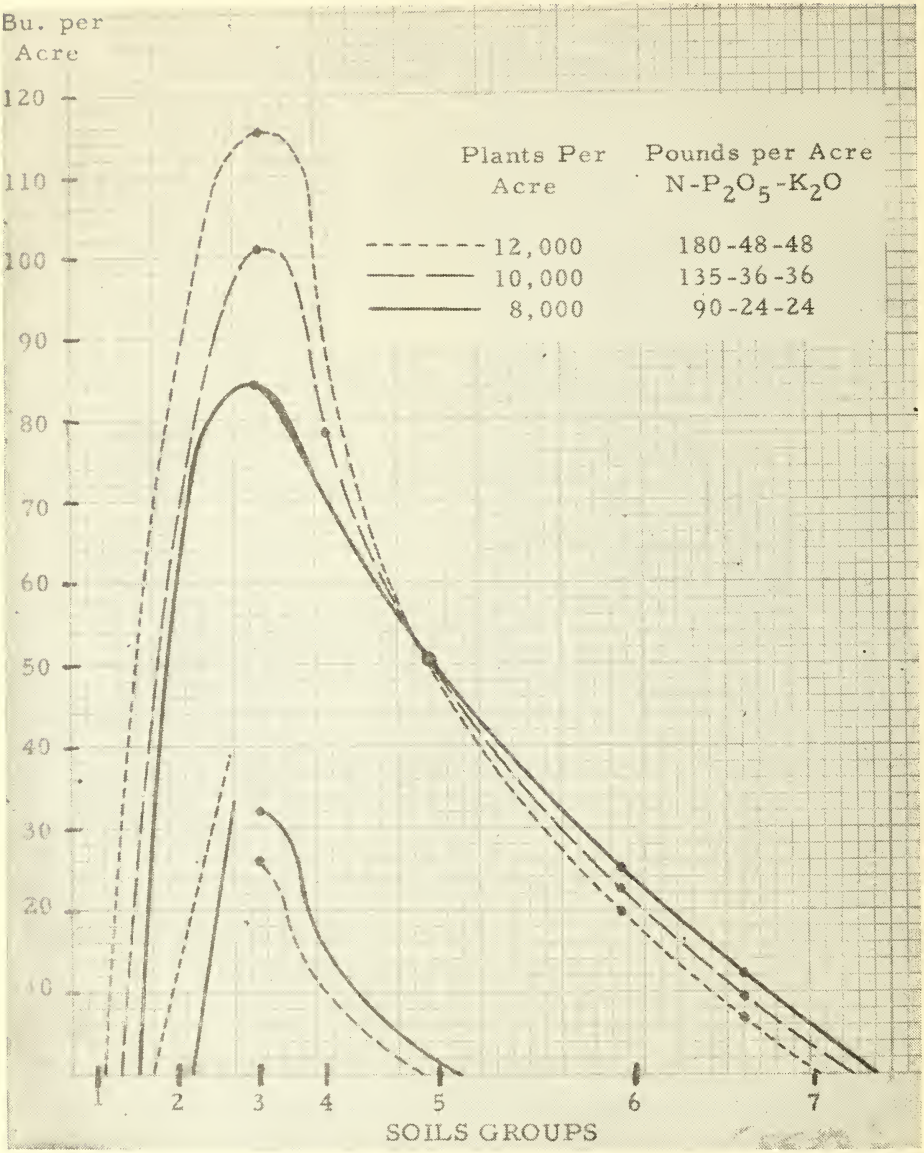


Figure 4. The three lines extending over practically the full range of the chart represent yields obtained during the five-year period under good production conditions, which will be discussed in relation to the different soils later in this report. The four lines in the lower center of the chart represent yields obtained under poorest production conditions, which occurred on the Group 1 and Group 2 (wet) soils in 1950, and on the other soils on some of the farms in the extreme drought in 1952. Yields for the three treatments represented by curves which appear to cross each other in this side-view will be seen from a point of view from which they appear as straight lines in a later part of this report, in Figure 10. (The length of the space represented by each soil group number along the base of the chart represents the proportion of the farm land of this area that is in that soil group.)

nection with the descriptions are the same as the ones used along the base of the chart in Figure 5. They are also included for use of technical workers in further identification of soils included in the different groups.

A brief review of year by year results with corn on the special study test demonstration farms may make the results more easily understood. In 1949, no replicated plot tests were used, but many results were recorded in the various fields by soils and treatments. From these results, and in consultation with production specialists and others, were made first approximations or estimates of the numbers of plants and amounts of fertilizers that will pay best on the different soils as grouped in Figure 5. The treatments selected were placed in identical duplicated plot tests and tried on each of Soil Groups 2, 3, 4, and 5 in 1950. Results were summarized and published in the April, 1951 issue of **Mississippi Farm Research**. That report showed that the lightest fertilizer treatments and widest spacings used, paid best on the dry hillsides (Group 5 soils), even though yields were slightly lower for this treatment; while the heaviest fertilizer treatments

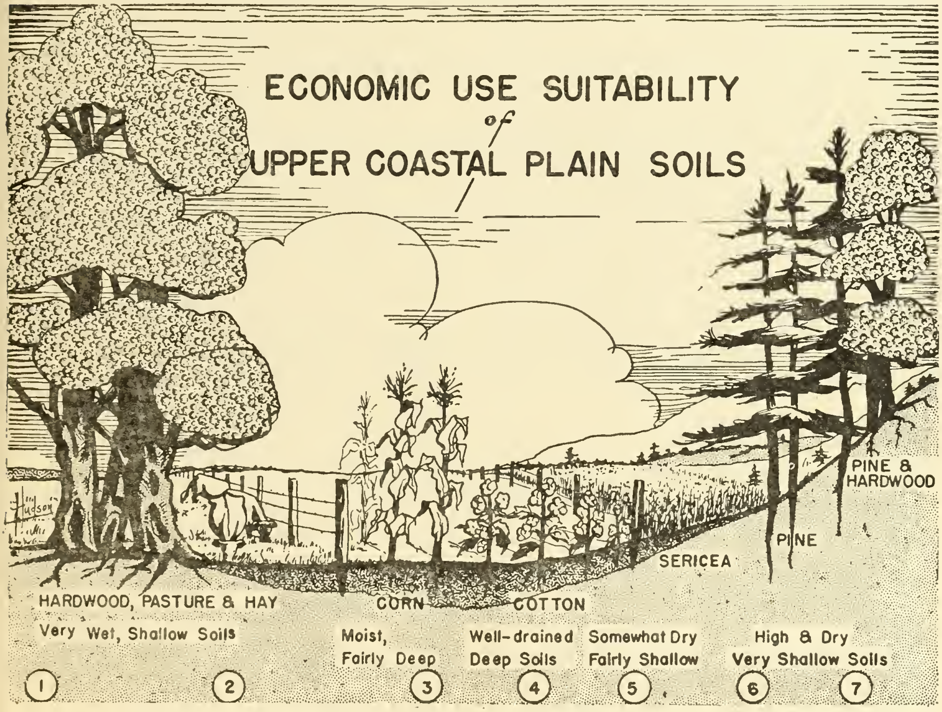

ECONOMIC USE SUITABILITY of UPPER COASTAL PLAIN SOILS
Hudson
PINE & HARDWOOD
PINE
SERICEA
HARDWOOD, PASTURE & HAY
CORN
COTTON
Very Wet, Shallow Soils
Moist, Fairly Deep
Well-drained Deep Soils
Somewhat Dry Fairly Shallow
High & Dry Very Shallow Soils
1
2
3
4
5
6
7

Figure 5. The most poorly drained soils are adapted to bottom-land hardwoods; soils with slightly better drainage, pasture and hay; better drained deeper soils, corn; well drained soils, cotton; excessively drained eroded soils, sericea lespedeza and pines; severely eroded soils on most rugged topography, mixed pine-hardwood uses. (Numerals at bottom of chart indicate groups of soils where data were recorded, but the groups are not here represented in proportion to farm acreage in the group as in Figure 4.)

Note: The Land Use Pattern Scale on which this chart is based is a scale of relative economic use stability. Its physical base is the area soil gradient, the gradual order according to which the soils are classified from one extreme at one end of the scale to the other extreme at the other end.

and thickest spacings paid best on the best corn soils (Group 3).

In 1951, the rates of application of fertilizers used in the tests were adjusted slightly downward. Otherwise, the tests were continued about as in 1950. Results for similar soils were averaged together again as in the previous year. They were reported for Soil Groups 3 and 5 in the February, 1952 issue of **Mississippi Farm Research.** Yields for all soils were much lower in the dry year of 1951 than they had been in the wet year of 1950. Yield differences in favor of the heaviest treatments and thickest spacings on the best corn soils were much less at the lower yields made in 1951. Differences in yields on the drier soils (Group 5) at the very low yields made in 1951 were in favor of the lightest treatments and thickest spacings.

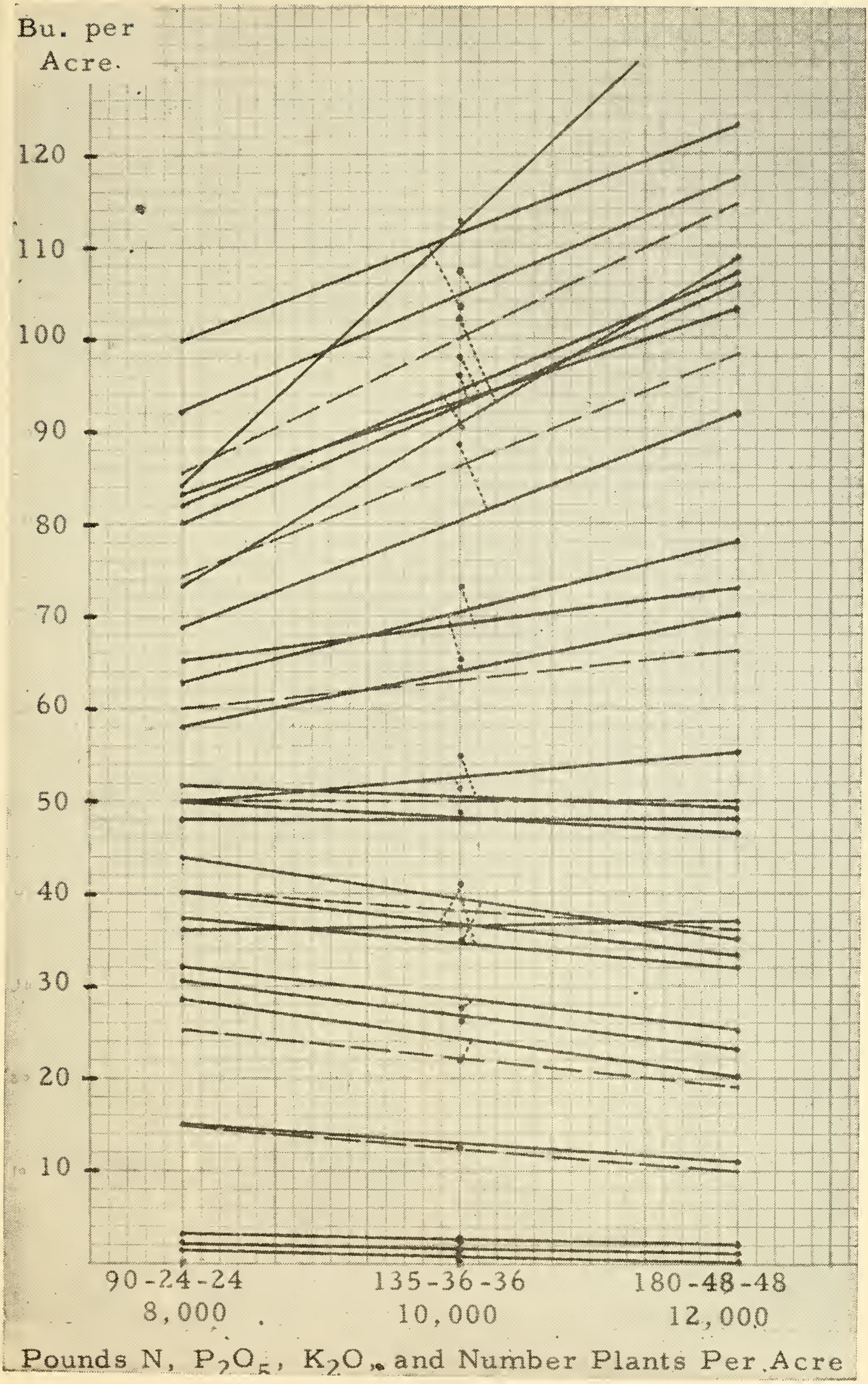
By the end of 1951 it appeared that treatments and widest spacings.
est value above fertilizer costs varied widely with soils and with other production conditions. It also appeared that yields for the three balanced treatments being used in the tests could be approximated for Group 4 soils from yields made on the soils in Groups 3 and 5. The three balanced treatments that had been used in 1951 were continued on a smaller number of soils but with a larger number of replications of the treatments on each soil in 1952.

The farms on which the tests were located were spread over a wide area, and production conditions varied among the farms from good to extreme drought. Where weather conditions were the same on soils in the two groups in which the tests were located, yields were always significantly higher, of course, on the Group 3 soils. But on the farms on which the drought was most severe, some abnormally low yields were recorded on good corn soils, just as some abnormally high yields (for the soils) had been recorded on some Group 5 soils in 1950. But, regardless of the cause, when the yields were high for the treatment with the smallest amount of fertilizers and the widest spacings, they appeared to be higher for the heavier treatments and thicker spacings. And when the yields were low for the treatment with the smallest amount of fertilizers and the widest spacings, they appeared to be lower for the other two treatments. This was also apparent from comparisons between single measurements by soils and treatments, which are made in the different fields each year.

As a check on these apparent possibilities, yield records from the 25 duplicated and triplicated plot tests in which results were most uniform within the test, indicating most nearly uniform soils, were selected. These data from Soil Groups 3, 4, and 5 were from the full range of production conditions in the three-year period over which the tests had been conducted, including good production conditions on poor soils and poor production conditions on good soils The average (mean) yields for each treatment in each test were recorded as points or dots on graph paper as in Figure 6 For each set of data (for each test) a straight line was drawn from the point representing average per acre yields for 8,000 plants and the 90-24-24 (N, P_2O_5, K_2O) fertilizer treatment to the point representing yields for 12,000 plants and double this amount of fertilizers.

These straight lines indicate the approximate slope of the yield response curves over this range of treatments at

Figure 6. Average (mean) corn yields and relative yields in 25 most uniform duplicated and triplicated plot tests, by treatments, seven special study test-demonstration farms in Alcorn, Prentiss and Tishomingo Counties, 1950-52. Solid lines are drawn from yields of extremes in treatments with results for the center treatments being indicated by the dotted lines. Broken lines represent the general direction of slope of lines over this range of treatments at the different yield levels.


Bu. per Acre.
120
110
100
90
80
70
60
50
40
30
20
10
90-24-24
8,000
135-36-36
10,000
180-48-48
12,000
Pounds N, P_2O_5, K_2O, and Number Plants Per Acre

the different levels of yields (see Figure 6). The distance by which the points representing yields for 10,000 plants per acre, and amounts of fertilizers midway between the other two amounts, vary from positions slightly above the straight lines are indications of the degree of uniformity in production conditions within the test area. That is, the closer the point is to this position, the more uniform is the production condition indicated for the test.

Because some of the results summarized in Figure 6 indicated that some of the test areas were not quite uniform or that some other things happened to cause variation in the results, some additional broken lines were drawn in to represent the average or general slope of the lines at the different yield levels. This was probably more necessary because the two or three trials represented by each point on each line were not enough to make the variations average out so that all the lines would show a uniform slope or direction in relation to other lines representing similar yields. Careful examination was made to find reasons for the variations from the general order that was clearly indicated.

The tests represented by the two lines sloping more sharply upward than the other lines in the upper part of Figure 6 were examined first. They were from the same test area, only different years, 1950 and 1951, and the soils were better where the heavier treatments were used. Then the one line that crossed three lines down at the 36 to 38 bushel yield level was given special attention. Two possibilities for a result like that on these soils were found. (1) A soil difference in favor of the plots on which the heavier treatments were placed could cause a result like this even at this low yield. (2) A season that is more favorable to the plots that mature later because of treatments with the heavier rates of nitrogen could cause it.[2]

Yields higher than 50 bushels per acre for 8,000 plants increased with heavier treatments and thicker spacings, and yields lower than 50 bushels, with the same treatments (including balanced fertilizers), decreased with heavier treatments and thicker spacings.

In 1953, five soils were selected (Jamison, Soil Group 3; Mantachie, 2-3; Tilden, 5; Ruston, 5. and Ora, 5) on six different farms (E. H. Davis, E. E. Richardson, W. G. Robinson, T. C. Pounders, W. O. Parker, and G. A. Glover) in four counties (Alcorn, Itawamba, Prentiss, and Tishomingo). Six identical replicated plot tests were put down using adapted Dixie hybrids and the treatments indicated at the base of the chart in Figure 7. Fertilizer materials used in the tests were ammonium nitrate and 12-12-12 nitric phosphate, a new material proven as to plant food value. They were provided by TVA as the other materials had been for the previous tests. Each treatment was put down six times in each test, the design of all tests following the order of duplicate Latin squares. (Each treatment occurred once on each four rows and once on each cross strip in each "square.") Check plots with 8,000 plants per acre and with 4,000 plants per acre, in which no fertilizers were used, were placed on the same rows between the two squares in the test.

For the yields obtained in each test, a

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[2] When results in the various individual tests were subjected to conventional analysis of variance procedures, differences in favor of the thicker spacings and heavier treatments were generally significant above the 60 bushel level. At yields lower than 60 bushels, according to these measures of single tests individually, differences between yields for the various treatments were generally not large enough in relation to the amount of variation among the plots to be classed as significant. But, when the tests were considered collectively, decreases in yields for 12,000 plants below the 45 bushel level and for 10,000 plants below the 35 bushel level were significant, with greatest percentage decreases at the lowest yield levels.

representing average (mean) per acre yields for 8,000 plants and the 90-24-24 fertilizer treatments to the point representing yields for 12,000 plants and double this amount of fertilizers. The results for the six tests, although at relatively low yields on most farms because of drought conditions, may be seen in Figure 7 as further evidence of the relative positions of yields for the heavier and lighter treatments at the different yield levels.

The broken line above the highest solid line represents the highest yield for each treatment in the test conducted under the best production conditions. The broken line below the lowest solid line represents the lowest yield for each treatment in the test conducted under the poorest production conditions. The differences between relative yields on these broken lines and relative yields on the solid lines for the same tests suggest that the same tendencies shown to be in effect over the full range of production conditions are also in effect, differing only in degree, over the narrower range within individual tests. Even so small an area of land as is used for a corn test may therefore, be thought of as a range in soils, a segment of the area soil gradient.

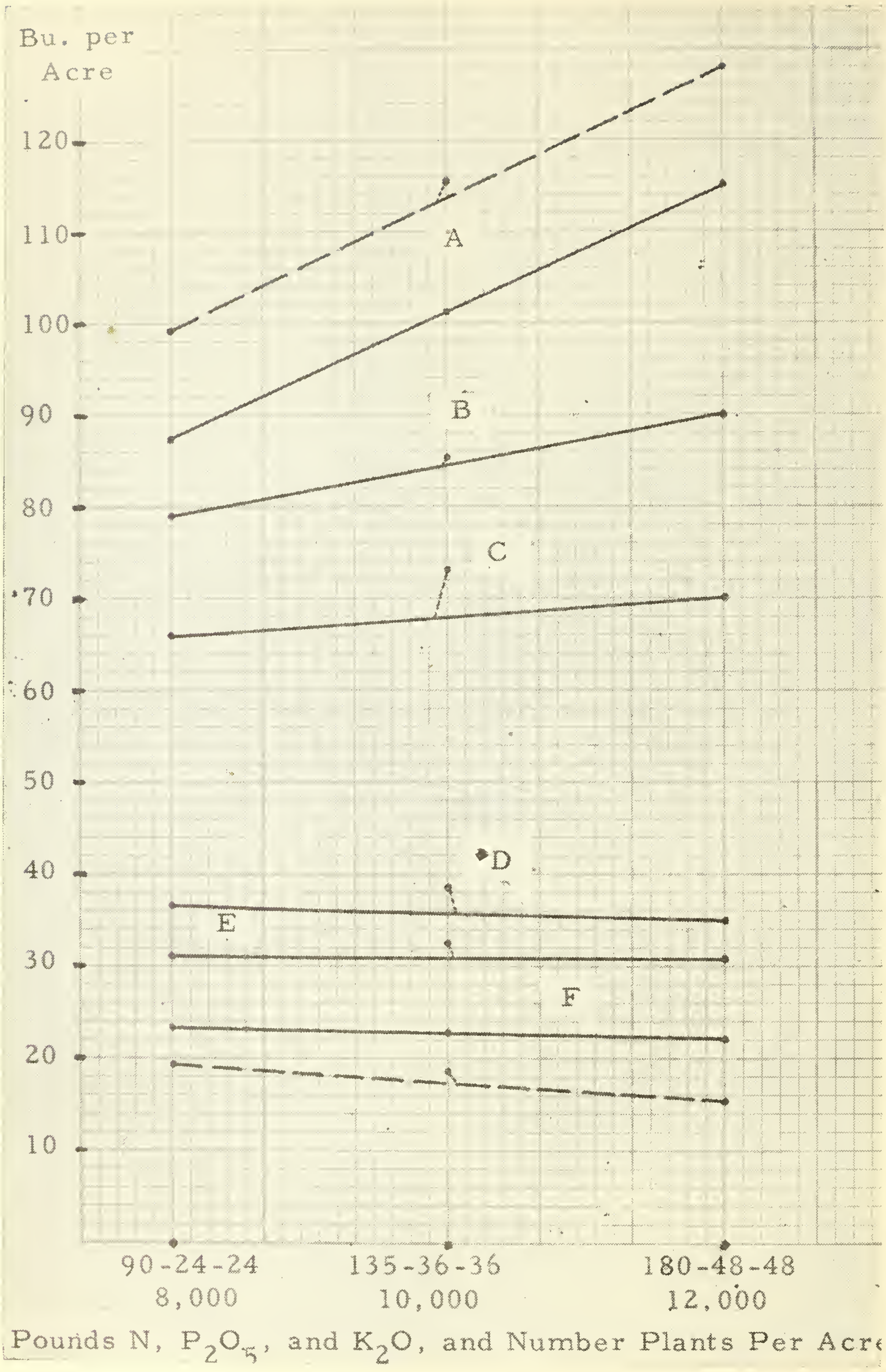
Minor variations in the data in Figure 7 from the pattern indicated in Figure 6 appear to be explainable by relative effects of weather on corn receiving the different treatments within the tests. About one-third of an inch of rain fell on some of the tests areas at a time when it appeared to help the plots that had received the heavier treatments and remained green longer more than it did the ones that had matured earlier, and even somewhat more than the ones that matured latest.

In results from the no-fertilizer check plots of the tests for which results are shown in Figure 7, it may be seen that the number of plants per acre that pays best without fertilizers also varies directly with soils and, therefore, with yields (Figure 8). The areas on which these check plots were located had been fertilized the same as the others in regular field practices in previous years, of course.

For confirming earlier observations that yields and relative yields in other areas follow the same pattern illustrated in Figures 6 and 7, five soils in four soils areas at four experiment stations were selected as follows: Grenada soils (Soil Group 5) on the Holly Springs station. Ecru soils (4) on the Pontotoc station. Kaufman soils (3) on the Central station at State College, and Ora (5) and Mantachie soils (2-3) at the Coastal Plain station. Replicated plot tests with adapted hybrids were used the same as in other experimental work with corn on experiment station farms, and by the same experiment station field workers.

Results for treatments comparable to those for which results are reported in Figures 6 and 7 may be seen in Figure 9. There is in the data from the experiment station farms one slight unexplained variation from the pattern, the relatively high yield of 39 bushels for the thicker spacing and heavier fertilizer treatment in relation to only 36 bushels for the wider spacing and lighter treatment at the Holly Springs station in 1953. However, the lowest line in the chart in Figure 8 represents yields for the same test area in 1952 when no late showers were recorded. Holly Springs is the only station for which yields for these three treatments are available in 1952. Results in all these tests in 1953, on all soils, on all stations, were entirely consistent with the data presented earlier in their indication that the treatment that will pay best varies directly with the yield levels.

The corn yields that have been recorded over the past five years represent results for the full range of production conditions for the various treatments us-


Bu. per
Acre
120
110
100
90
80
70
60
50
40
30
20
10
A
B
C
D
E
F
90-24-24
8,000
135-36-36
10,000
180-48-48
12,000
Pounds N, P_2O_5, and K_2O, and Number Plants Per Acr

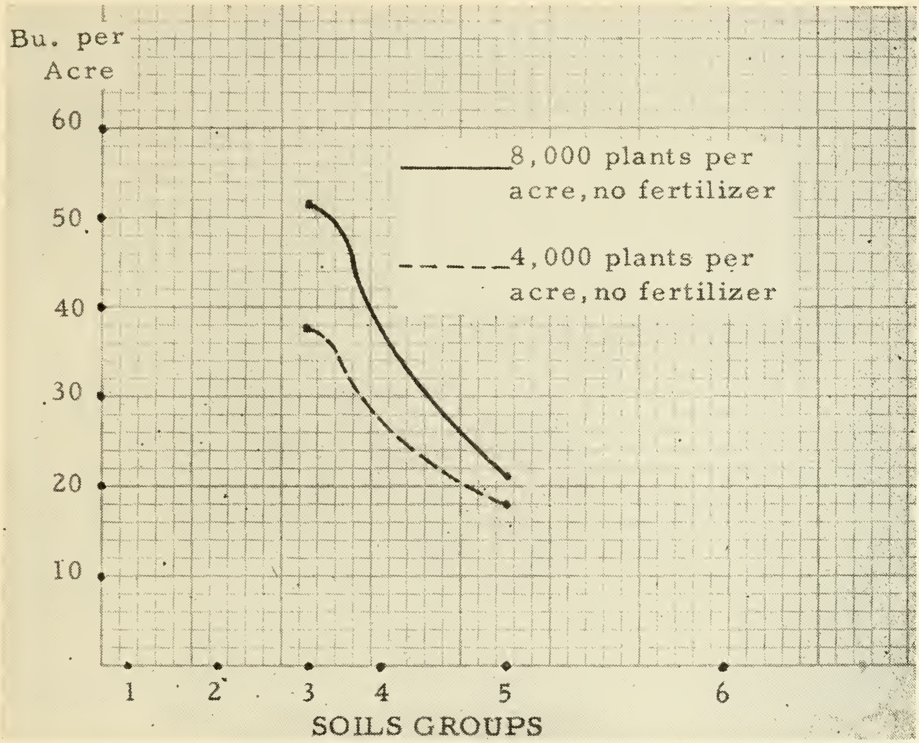


Figure 8. In the no-treatment check plots used with the six corn tests for which yields are reported in Figure 7, yields for 8,000 plants per acre ranged from 14 bushels per acre more than those for 4,000 plants per acre on Group 3 soils to only 2.6 bushels more on Group 5 soils.

ed. The yields obtained under reasonably uniform production conditions[3] formed a remarkably uniform pattern.

Yields above the 50 bushel yield level for 8,000 plants per acre were generally increasing, in response to more plants and fertilizers, in the same proportion that they were decreasing at the same distance below this center line through the system. Moreover, these rates of increase and decrease were found to be in proportion to the distance above or below the center line. It then became possible, when a yield for 8,000 plants (and the accompanying balanced fertilizer treatment) was known, to figure what the yields were for 12,000 plants (and the accompanying balanced fertilizer treatment), under the same production conditions that were reflected by that yield.

For example, at ten bushels above the center line at the key point (50 bushels from 8,000 plants) a ten percent increase placed the yield for 12,000 plants at 66 bushels; while from ten bushels below the center line at 8,000 plants, a 10 percent decrease placed the yield for 12,000 plants at 36 bushels. For other illustrations of these percentage relationships, the reader may wish to return to Figure 6 and re-examine the broken lines used to indicate the average or general slope of the lines at the diffrent yield levels. (One bushel up or down the 8,000-plant line is 1 percent of the range in yields for this treatment.)

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[3] Production conditions were considered uniform when neither of the treatments had an advantage in quality of soil, and when the same weather conditions under which the corn on the plots receiving the lightest treatment grew and matured continued until the corn on all the other plots matured.

Figure 7. Average (mean) corn yields and relative yields in six tests, on five soils on six farms in four counties, with three treatments, repeated six times in each test, 1953. A, E. E. Richardson farm (Soil Group 3), B, E. H. Davis (3), C, W. G. Robinson (2-3), D, W. O. Parker (5), E, G. A. Glover (5), F, T. C. Founders (5).

When yields for the various tests in 1953 were in, the assistance of mathematicians was requested for more completely describing the order among yields at the different levels of production. It was already described in one direction (in bushels, percentages, and according to soils along the area soil gradient) from the lowest yields to the highest, and in the other by lines indicating the relation of yields for 8,000 and 12,000 plants per acre. Because of the wide range in yields represented by the data and because of the difference in position of the yield for one treatment in relation to the yields for other treatments at the different yield levels, the problem of mathematical representation of the order revealed in the data proved to be a rather simple one Only one type of curve was found that would describe the data over the full ranges in yields and treatments. It is represented in Figure 10 by a series of curves, all constructed according to the same mathematical formula. It is the same lype of formula used to describe the course or path that a bullet or other object tends to follow in travelling through space under uniform influences, or without hinderance as in a vacuum.

In Figure 10, the curve marked "A" is representative of production on the best corn soils, in Group 3, in years of good seasons for corn. The seasons were good for corn on these soils in the best locations in each of the past five years. These best locations, among farms on which yields were recorded, were just west of the divide between the Tennessee and Tuscumbia River watersheds near the line separating Alcorn and Prentiss counties (those locations may be more subject to tornadoes also). On the east side of the divide, which is in few places more than 200 feet higher than other surrounding areas and only about 600 feet above sea level, and north and south of the path followed by relatively more showers during the growing seasons, yields for the Group 3 soils were similar to those represented by curve "A" in only three of the five years. In one of the other two years, they were more like the yields represented by curve "B"; while under the most extreme drought conditions, in 1952, they were represented by curve "D."

Yields on the Group 4 soils were as good as those represented by curve "B" in two of the five years. Yields on the Group 5 soils were as good as the ones represented by curve "C" in two of the five years on most of the farms. During the other three years, they ranged between that and practically no production under the poorest conditions. For the Group 6 soils, curve "D" is representative of yields obtained under good production conditions, which occurred on some of the farms in two years and on others in only one year during the five-year period. For corn production, these soils might be thought of as "one-talent" land. For each of the soils and production conditions, the treatment that will generally pay best is indicated in the old, old story, "to each according to his ability." Curve "E" is representative of results on the steepest, most eroded soils in cultivation under the best production conditions.

The broken lines in Figure 10 are indicative of other curves that may be drawn in to represent yields other than those represented by the solid lines.

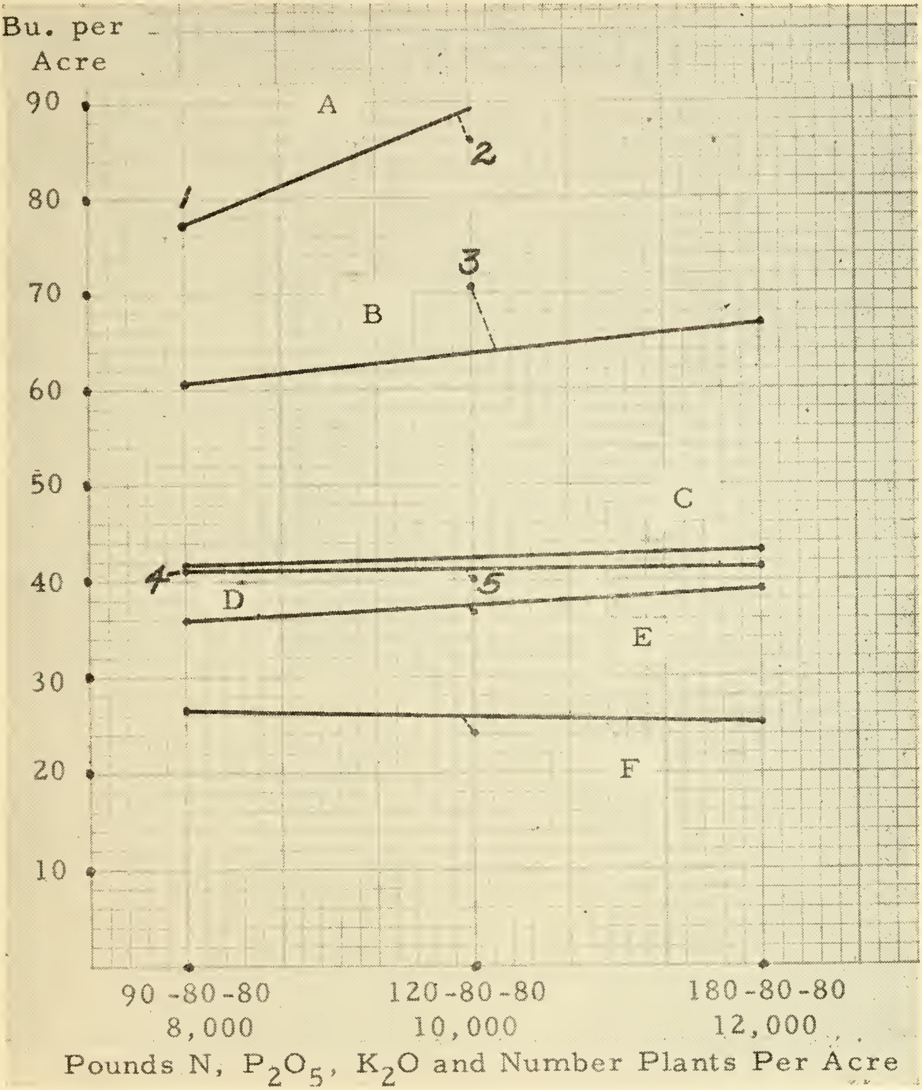

Figure 9. Average (mean) corn yields and relative yields in six tests, on five soils on four Experiment Station farms in four soil areas, five replications, 1953 (one test in 1952 as indicated below:

A. Central Station (Soil Group 3); B. Coastal Plain Station (2-3); C. Coastal Plain Station (5); D. Pontotoc Station (4); E. Holly Springs (5); F. Holly Springs, 1952 (5).

1. Yield for 90 pounds N and 8,000 plants was computed by averaging 58.9 bushels made with 60 pounds N and 4,000 plants and 97.4 bushels made with 120 pounds N and 12,000 plants. 2. Yield for 120 pounds N and 10,000 plants was computed by averaging 74.6 bushels made with 60 pounds N and 12,000 plants and 97.4 bushels made with 120 pounds N and 12,000 plants. 3. 12,000 plants. 4. Yield for 90 pounds N was computed by averaging 43 bushels made with 60 pounds N and 39 bushels made with 120 pounds N. 5. Yield for 10,000 plants was computed by averaging 39 bushels made with 8,000 plants and 41.1 bushels made with 12,000 plants.

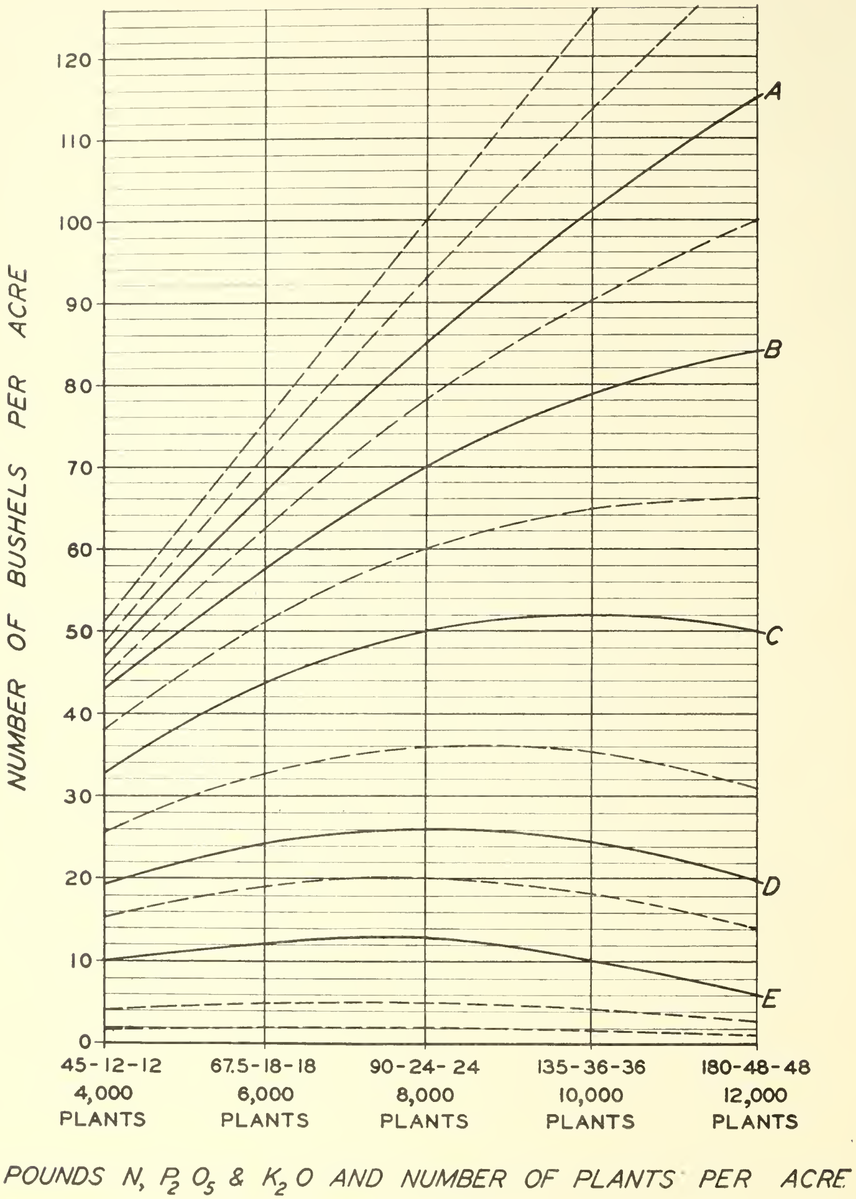

Figure 10. As contrasted with the side view in Figure 4, in which yields for 8,000, 10,000 and 12,000 plants per acre were represented by curved lines, this view is straight down the area soil gradient,* a point of view from which these same yields from the treatments appear as straight lines.

As a first approach toward the best understanding of what is summarized in this chart, it is suggested that the corn grower hold the chart in front of him, lean the top of it away from him

Other curves could be sketched in reasonably accurately by drawing them in relation to the ones already on the chart, or any points through which other curves would pass could be figured from the mathematical formula presented in the Appendix.

For an indication of yields to be expected for heavier or lighter treatments for a production situation for which a yield record is available for a balanced treatment, the reader may locate in the chart the point that represents the yield and treatment, and see which curve most nearly represents his production situation. With yields represented along the curve, he can soon find the point at which the value of increases in yields about equals increases in costs. A check of that point on the curve against the corresponding point at the base of the chart will give an estimate of planting and fertilizer practices that will pay best in production situations similar to the one in which the known yield was obtained.

This estimate can then be improved somewhat by increasing slightly the number of plants in relation to the amount of fertilizers. However, one would not usually use quite as many plants as would be required to make the highest possible yield, because of the decrease in quality of corn that would accompany the last small increase in quantity. But this adjustment toward a somewhat larger number of plants in relation to amounts of fertilizers is necessary because of the relatively lower cost of additional plants. Also as a part of this final adjustment, it may be helpful to observe in Figure 8 that the number of plants that will pay best without fertilizers also varies with soils and that the base from which to begin increases due to efficient use of fertilizers on the better soils is a larger number of plants than the 4,000 used at the left margin of the chart in Figure 10. Although the data in Figure 8 indicate that there may be little difference in the quantity of corn produced by 4,000 plants on a dry, eroded soil and a larger number of plants on the same soil at very low yield levels, they show that substantial parts of the increases in yields at the higher levels near the left edge of the chart in Figure 10 are due to the increasing number of plants on the better corn soils where not enough plants are used. For example, at the Central Station in 1953, yields for 120 pounds of nitrogen were 97.4 bushels per acre for 12,000 plants as compared with only 57.8 bushels for 4,000 plants. (In 40-inch rows,

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and downward; then imagine that it is a good year for corn and that he is standing on an eroded hillside, at the upper edge of a wide corn field, where the soil gradually gets deeper and better all the way down the hillside as the topography flattens out down toward the bottom land where the best corn is growing; that he imagine, further, that the bottom land is a little sandy on the side next to the hill but that it gets gradually better for corn farther over into the bottom to where the farm operator's "pet acre" is located, the one he depends on to beat his neighbors in growing corn.

Now, imagine each curve on the chart as a few rows of corn on which the soil is exactly the same all the way around the hillside that the rows curve around with the terraces or on the same contours. In planting this field, imagine further that the farmer planted and fertilized every row alike, beginning at the left end of the rows and gradually opened his planter and distributor up, as he went along the rows, as indicated by the figures along the bottom of the chart.

This report includes a statement of how the various yields summarized in the chart applied in the different seasons and on the various soils. It also suggests that if the corn grower knows about what yield he has been making and about what balanced treatment he has been using, he can find in the chart approximately what curve he was on and see what yields could be expected, under the same production conditions, for more plants and fertilizers or for fewer plants and less fertilizers.

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*It would be equally correct to say "straight down the land use pattern scale," because that scale and the area soil gradient appear the same from this point of view.

4,000 plants per acre is one plant about every 40 inches in the drill; 12,000 plants is one about every 13 inches.)

An economic analysis of available data on balance between number of plants and amounts of fertilizers indicates that the most efficient combination has relatively more plants in relation to amounts of fertilizers than the one represented in Figure 4, because of the relatively lower cost of additional plants. Present indications are that the practical range in number of corn plants for non-irrigated conditions in North Mississippi is generally from about 6,000 plants under the poorest production conditions to about 12,000 plants in the best production situations.

The variations in amounts of fertilizers that will pay over this same range may be from as little as 30 pounds of nitrogen and proportionately low amounts of minerals, on very dry eroded soils where probable yields are 20 bushels or less, to as much as 150 pounds of nitrogen and amounts of minerals nearly as great as those indicated in Figure 10 on soils which are well adapted to corn and where other production conditions indicate probable yields of 100 bushels or more. For irrigation conditions, where little information is available, the figures for this range may need to be increased about 25 percent for number of plants and about 20 percent for amounts of fertilizers.

APPENDIX

For Technical Workers

The formula, $y=a+bx+cx^2$, describes a parabola, when y represents yield, a represents the value of y at the point of origin of the treatments applied (zero in the series used in this report), b and c represent constants, and x represents the number of units of the treatment from which the yields are calculated for the different curves representing different production situations. The formula developed by the author for describing the relation between the yields for 8,000 and 12,000 plants describes a tangent or a chord of an arc of the parabola formed when adapted Dixie hybrid corn plants are grown in proportionately increasing numbers with fertilizers also applied in proportion as in Figure 10. This formula is based on the yield for 8,000 plants. The curves are all therefore directly related by percentage distances along the 8,000 plant line. (They are also connected at the point of origin, no plants, no fertilizers, no yields.) When y is the yield with 8,000 plants, the yield calculated from it for 12,000 plants is equal to

$$y + y\left(\frac{y-50}{100}\right), \text{ or } \frac{y}{2} + \frac{y^2}{100}.$$

From these two formulae, the following general equation was developed by using the data summarized and described in the latter to calculate the constants b and c in the former. When y is a known yield for 8,000 plants and fertilizers as indicated for this number of plants in Figure 10, and x is the number of thousands of plants (with fertilizers in proportion as in Figure 10) for which the yield is to be calculated, the yield for other points on the curve reflected by the known yield is equal to

$$\frac{1}{24}\left(7y-\frac{y^2}{25}\right)x-\frac{1}{48}\left(y-\frac{y^2}{100}\right)x^2.$$

To find on one of these curves the number of thousands of plants at which the highest total yield occurs, subtract y (the yield for 8,000 plants) from 175, multiply by 4, and divide by the amount by which y falls short of 100 bushels. Conversely, to find the yield for eight thousand plants on a curve on which eight thousand or more plants will produce the maximum yield (25 bushels or more), and on which the maximum yield will occur for a specified number of plants, set that number of thousands of plants, that value of x, equal to

$$\frac{4(175-y)}{100-y}$$

and solve for the value of y. To find the maximum yield for a curve, square the amount by which 175 exceeds y, multiply by y, and divide by 300 times the amount by which y falls short of 100 bushels. For an estimate of the point at which the yield would return to zero, with the plants spaced so they compete evenly, double the number of plants found for the point of maximum yield. (Actually, some of the plants would lose out in the competition, and some of the others would still make some corn.) The entire curve can then be sketched roughly from the two zero points, the highest point, and the point representing the yield for 8,000 plants. (Or other points on the curve can be located by use of the general equation for the curves.)

When a better corn than the present Dixie hybrids is produced, the number of bushels by which it exceeds 100 with 8,000 plants, under conditions comparable with the best under which data reported in this statement were obtained (without manures, newground, or irrigation), will measure the proportion by which it is better. The equation can then be adapted to that system either by substituting the new figure and one-fourth of it serving in the constants in the general equation, or by treating yields as percentages of that higher yield for 8,000 plants and then converting back to bushels. The key point through which that system will split will be 50 percent of that improved yield for 8,000 plants. To use yields from a number of plants other than 8,000 from which to make the calculations, the one-twenty-fourth and the one-forty-eighth in the general equation would have to be changed also, of course.

This order in relative response to treatments, relative to the maximum for a treatment in the system (the maximum on a treatment curve), with each response reflecting position of the corresponding production conditions in the system, may be the key for approaching similar description of other system. In other fields of agriculture, even while developing data for obtaining the constants to use in general equations for describing the entire systems, we should be able to draw some curves that would enable an operator, with an established production response, better to estimate what other responses would tend to be for the production conditions reflected by the known response; that is, for the farm operator, use of a single production response to indicate other probably responses for the same or similar production conditions should not have to await complete and organized description of the system as in Figure 10. As the system described in this statement is for the adapted Dixie hybrids, as represented by Dixie 33, Dixie 17, and Dixie 22 at the present time, so other systems may be expected to be "each according to its kind."

An order in the rate of increase in yields with additional plants and fertilizers is indicated in Figure 10, along the various curves, as well as among them. The increases in number of bushels yield for 5,000 plants above that for 4,000 plants are about 1.5, 3, 6, 8, and 10 for curves E, D, C, B, and A, respectively. The differences in increases for 6,000 plants above those for 5,000 plants are proportionately still greater than these, ranging from about two-thirds of these amounts on the lower curves to more than 90 percent on curve A. It may be observed, further, that over the range represented in Figure 10, the increases per additional 1,000 plants are constant amounts on the top broken line, which appears as a straight line over this range and may be thought of as asymptotic to the theoretical boundary of the system.

In 1923, in the **Journal of Farm Economics,** (Vol. V), and in his text book **Farm Management,** (the Orange Judd Publishing Co., New York) W. J. Spillman used a type of curve similar to the up-sloping part of the ones used in Figure 10 in illustrating the tendency toward a constant order in diminishing effectiveness of one or a combination of factors, or in the decreasing amount of production added, when successive additional similar applications were made to a production unit, such as an acre of land or an animal. By using units of appropriate size, Dr. Spillman was able to illustrate constant rates of decreasing per unit effectiveness for fertilizers on various crops, feeds for various livestock, and for irrigation water. The same can be done with the curves in Figure 10, indicating close similarity between the two types of curves over the range over which both Dr. Spillman, and the German experimenter Mitscherlich, to whom he referred, used them. That type of curve is commonly referred to as an exponential curve, representing a decreasing geometric series. The formula for it is $y=M-AR^x$, when y represents yield, M represents the maximum yield on the curve, A represents the amount by which yields can be increased by the treatments being applied, and x represents number of units of the treatment corresponding to the yield represented by y.

For some purposes, and for many individuals, the exponential curve may have advantages over the parabola over the range of the curves, the up-sloping parts, to which the exponential curves apply. This is especially true after development of the values of constants and procedures as set out above, simplifying the work involved in their use. Exponential curves also can be drawn from a single yield, by using the constants developed for the parabola to locate the maximum yield for each curve as explained above. Substitutions may then be made in the formula for the exponential curve. The yield from which the maximum yield for the curve was calculated may be substituted for y. The maximum yield may be substituted for M and for A. The value of x corresponding to the yield used for y may be substituted for x. The value of R to the power indicated by the value of x can then be figured from the simple arithmetic indicated by the equation in which R has become the only unknown. With the value of R to the power indicated one can then turn to a table of values of R^x, as on pages 60-62 in reference indicated below, and read the value of R. Then from the same line on which the value of R is read, the value of R to the other powers can be read for locating other points on the curve.

Yields indicated near the lower ends of the exponential curves may be higher than those indicated for the same range of the parabolae. But there is little difference between the two over the range of efficient operations, the parts of the curves in which economists and corn growers are most interested. The relations between exponential curves and along exponential curves would still be similar to those represented in Figure 10 for the parabolae. Neither of these types of curves can be entirely correct for the lowest values of x, because with an increasing number of plants each curve actually appears to start out as a straight line, short for the lower curves and much longer for the higher ones. Neither present experimental data not present mathematical science can determine precisely where these apparent straight lines change to curves, that is, where, under production conditions represented by each curve, plants begin to crowd enough to interfere with each other. But the position of this greatest change in rate of curvature, smoothed out in the curves, is considered to be so far to the left of the range of efficient operations, and to represent yields so near the same as those represented by the curves, as to be of little practical importance to the corn grower.

In 1931, writing as Principal Agricultural Economist for publication in **United States Department of Agricultural Technical Bulletin 348,** Dr. Spillman reported both the types of curves discussed above as fitting experimental data satisfactorily. In the same report he observed that "an equation expressing even approximately the relation between plant growth and quantity of plant food applied in fertilizers would enable the experimenter to carry on investigations of both these problems with a relatively small number of experimental plots. At the same time, it would give more accurate answers to the two problems than could be otherwise obtained." Then, in what appears to this reporter as near prescience of such a set of curves as presented in Figure 10, he stated "a large number of experiments have been performed in which the quantity of one or more growth factors was varied. When the results of these experiments are graphed . . . . a large proportion of the resulting curves are strikingly similar in form . . . In fact, the proportion is so large as to suggest that in many cases those that do not give such a curve fail to do so because of large experimental errors in the work."

M62b
no 517

BULLETIN 517 MAY, 1954

Cotton Marketing
in the
Upland Area of Mississippi

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director

STATE COLLEGE MISSISSIPPI

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This publication reports on a Mississippi phase of the Southern Regional Cotton Marketing Project SM-1 which was financed in part from Title I 9(b) 1 and 2 and 9(b) 3 funds made available under provisions of the Research and Marketing Act of 1946.

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COTTON MARKETING IN THE UPLAND AREA OF MISSISSIPPI

By

CHESTER M. WELLS, JR. and JAMES M. BEAIRD

SUMMARY AND CONCLUSIONS

The numerous textile mills throughout the world manufacture finished textile products of many kinds or constructions, the qualities of which sometimes vary over a wide range. For each textile construction of any particular quality, raw cotton of a specific quality is a necessity. Textile constructions of different qualities have different values, consequently the qualities of raw cotton used in their manufacture have different values. The value of cotton to a textile mill is also influenced by the spinning performance of the cotton consumed. Spinning performance is determined by character as well as grade and staple. Consuming textile establishments recognize the value differentials of cotton of different grade, staple, and character and are willing to pay for them. In fact, because of a high degree of competition they must pay prices in line with the spinning values of specific qualities of cotton. Because of this condition, prices paid by mills can be accepted as the true spinning value of cotton.

The cotton purchased by consuming establishments usually is in lots of 100 bales all of which are of one specific quality. It is the function of the cotton merchandising system to assemble the production of the many widely scattered cotton farms and to make available to textile mills "even-running" lots of cotton of desired specific qualities. In performing this function the merchandising system must serve the interest of both users and producers of cotton. To serve either group effectively the merchandising system must pay to producers prices which reflect the spinning values of specific qualities of cotton. Such prices encourage farmers to attempt to produce the qualities of cotton demanded by mills. In many instances the marketing system does not reflect such values to producers, thus failing to serve the best interest of producers and of users of cotton.

The extent to which spinning values are not reflected by prices varies considerably among types of markets. The types of markets found in the cotton merchandising system are: (1) futures' markets in which supply and demand are brought together establishing the price level for cotton, (2) spinners' markets in which the spinning value of specific qualities of cotton is determined, (3) merchants' markets in which cotton is combined into "even-running" lots for shipment to mills, and (4) farmers' markets in which the cotton of individual producers is concentrated, usually for resale as mixed lots in merchants' markets.

As a result of the high degree of competition in futures markets, quoted futures prices can be accepted as an accurate market appraisal of current supply and demand conditions. Also, as has already been pointed out, prices paid by mills can be accepted as the true spinning value of cotton. Furthermore, all available data indicate that prices paid in merchants' markets available to Mississippi farmers generally reflect the spinning value of cotton less necessary marketing costs and reasonable returns to cotton shippers. It remains, therefore, that failure of the marketing system to reflect spinning values to producers is largely the result of inadequate marketing services in farmers' markets.

Some of the inadequacies of farmers' markets are readily apparent. First, due to the small volume of cotton marketed, the typical farmers' market in the Upland area of Mississippi contains a limited number of buyers, many of whom are unable to determine the market value of individual bales of cotton on the basis of all quality factors. Second, the lack of competition due to the small number of buyers in these markets results in prices to producers that are below market values. Third, as a result of the high per-bale cost of handling a small volume of cotton, the value of cotton sold in these markets is less than the value of a comparable quality sold in merchants' markets.

Producers could, in most cases, increase their income from cotton sales by selling cotton somewhere other than in small farmers' markets such as those just described. One alternative is to sell through a recognized sales agency in merchants' markets. Producers in some areas of the cotton belt merchandise significant proportions of their production through sales agencies in merchants' markets. In the Upland area of Mississippi, however, producers have not taken full advantage of this method of sale.

In recent years a new marketing outlet has been available to producers in the Upland area. Recognizing the need of improving the competitive marketing position of producers in the area, Mississippi Federated Cooperatives (AAL) organized a cotton marketing department in 1940. Since the organization of its cotton department, this cooperative has maintained facilities for handling a large volume of cotton. It also has attempted to appeal to producers by offering a wide variety of merchandising services.

Producers have failed, however, to utilize fully the available merchandising services but have tended to use the cotton marketing department of this cooperative primarily as a means of placing cotton in the Government loan. As a result, Mississippi Federated Cooperatives has received relatively small quantities of cotton in years when the market price has been significantly above support levels and has received large quantities when market prices and support prices have been near the same level.

The failure of producers to consistently patronize the cotton department has resulted in considerable fluctuation in the per-bale cost of handling cotton. This fluctuation has been due primarily to the nature of the cost structure of cotton merchandising firms. Such firms have high fixed costs and must handle large volumes of cotton in order to operate efficiently. Large volume in some years has resulted in low per-bale cost of operation by Mississippi Federated; small volume in other years has resulted in high per-bale cost.

Variability of volume handled has resulted in highly variable income of the cotton department of Mississippi Federated Cooperatives. In years when volume of cotton handled has been large, income has been high. In years when volume has been small, income has been low.

The effect of variability of volume is reflected in net earnings of the marketing department of the cooperative. Net earnings of the cotton department have tended to be high when volume has been large and low when volume has been small. This, of course, has influenced directly the returns to producers since larger earnings have resulted in larger patronage refunds.

Returns to producers who have marketed cotton through Mississippi Federated Cooperatives have been satisfactory for two reasons: (1) the sales force has accomplished something that most producers cannot accomplish themselves, that is, it has sold cotton for its actual value, and (2) the cost of merchandising has, in most years, been kept below the charges made and patronage refunds have been paid to producers. These refunds would have been substantially larger, in most years, if producers had provided sufficient volume to permit lower per-bale cost of operation. Patrons of the cooperative should be led to realize that these patronage refunds are of secondary importance and that the real gain to producers comes from the efficient merchandising program.

RECOMMENDATIONS

In order to utilize more fully available marketing facilities and thus reduce per-bale overhead cost, the cooperative has been forced to resort to the practice of buying cotton outright. This practice, if incorporated as a permanent feature, may ultimately accrue to the detriment of those producers who patronize the organization as a sales agency. The future policy of the organization is, of course, the joint responsibility of the membership, the Board of Directors, and the hired management. As a step in the direction of expanding and improving the marketing program it is urged that these responsible groups give careful consideration to the following recommendations:

1. Since uncertainty of receipts imposes the greatest limitations on the organization, efforts should be made to induce producers to patronize the cooperative consistently. An effective educational program seems to be the best approach to the problem of low volume and uncertain receipts. Mississippi Federated Cooperatives should initiate a program to teach farmers the facts of cotton marketing and to acquaint them with the nature of the services offered by the organization.
2. When the educational program becomes effective and constant participation by producers becomes a reality, the cooperative should discontinue outright purchase of cotton. When this stage of development is reached, the merchandising program should be limited to (1) making of cash advances to producers for cotton received, (2) placing cotton in and withdrawing cotton from the Government loan, and (3) selling of cotton and of loan equities.
3. No cotton should be accepted by Mississippi Federated Cooperatives for placement in the Government loan unless the producer signs an agreement permitting the sales department, at its discretion, to withdraw and sell equities in Government loan cotton. Such an arrangement would permit efficient merchandising of loan equities because cotton could be grouped into "even-running" lots of grade and staple and sold when market conditions improved. It is the sale of "even-running" lots of cotton in merchants' markets that causes the value of cotton in such markets to be greater than the value in farmers' markets. By permitting the sales department to assume this greater responsibility, producers can increase the value of their product and realize the resulting higher prices.

INTRODUCTION

The numerous textile mills throughout the world manufacture finished textile products of many kinds or constructions, the qualities of each sometimes varying over a wide range. For each textile construction of any particular quality, raw cotton of a specific quality is a necessity. Different textile constructions and different qualities of each construction have different values; consequently, the qualities of raw cotton used in their manufacture have different values. The value of cotton to a spinning establishment is influenced not only by grade and staple but also by spinning performance which influences the cost of manufacturing yarns. For example, two bales of cotton of the same grade and staple might yield end products of equal quality but one might be worth more to the spinner because its use resulted in lower costs of processing due to differences in strength, fineness, uniformity, maturity, and/or other fiber characteristics. Consuming textile establishments recognize these value differentials and are willing to pay for them. In fact, because of a high degree of competition they must pay prices in line with the spinning values of specific qualities of cotton. Because of this condition prices paid by mills can be accepted as the true spinning value of cotton.

The needs of manufacturers and the conditions of production make cotton one of the most difficult commodities to market. On the one hand, the cotton purchased by consuming establishments usually is in lots of 100 bales, each composed of one specific quality. On the other hand, the cotton produced on many widely scattered farms has a wide range of distinctive, measurable qualities. It is the function of the cotton merchandising system to assemble the production of the many widely scattered cotton farms and to make available to textile mills "even-running" lots of cotton of desired specific qualities.

In performing this function the merchandising system must serve the interests of both users and producers of cotton. To serve either group effectively the merchandising system must pay to producers prices which reflect the spinning values[1] of specific qualities of cotton. Such prices encourage farmers to attempt to produce the qualities of cotton demanded by mills. Prices will not serve as guides to production unless prices paid to farmers reflect the true spinning values of cotton. In many instances the marketing system does not reflect such values to producers, thus failing to serve the best interests of producers and users of cotton.

Prices paid to producers may fail to reflect true spinning values by being below the prevailing level of price or by not recognizing the relative values of different qualities of cotton. This condition may be the result of: (1) failure of producers to follow best known marketing practices and/or to utilize the most efficient marketing facilities available, (2) excessive cost of performing many of the marketing functions, due either to inefficient operation of marketing agencies or to the small volumes of cotton marketed and (3) excessive profits due to inadequate competition.

Purpose and Method of Study

The extent to which excessive costs and profits result in prices to producers that fail to reflect true spinning values of cotton varies considerably between types of markets. The purpose of this study is to investigate the possibilities of improving the competitive position of the cotton farmer in the Upland area[2] of Mississippi so that he may be able to sell cotton for prices more nearly in line with true spinning values. This was done by briefly appraising the organization of, the degree of competition within and the services performed by different types of markets and by studying in detail the possibilities of marketing cotton cooperatively.

Since early in 1948 the Mississippi Agricultural Experiment Station has participated in the Southern Regional Cotton Marketing Project. Appraisal of the organization of, the degree of competition within, and the services performed by different types of markets was based on the cumulative results of this regional research project, on observations made while doing field work for this project and on published research findings of other agricultural agencies.

The detailed study of possibilities of marketing cotton cooperatively was based on data obtained from Mississippi Federated Cooperatives (AAL). This organization has for a number of years provided cooperative cotton marketing services for producers in the State. Complete records were obtained for each of the marketing seasons beginning with 1940-41 and ending with 1951-52.

In addition to providing a basis for appraising the possibilities of improving the competitive marketing position of all producers in the area, it was felt that study of the experiences of this firm might disclose means of improving its marketing methods, thus improving the marketing position of patrons of the organization.

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[1] Spinning value, in terms of prices received by farmers, is the price paid by mills minus the marketing costs necessary to make cotton available to mills.

[2] The Upland cotton producing area of Mississippi is composed of all the counties in the State other than the eleven Delta counties of Tunica, Coahoma, Quitman, Bolivar, Sunflower, Leflore, Washington, Humphreys, Issaquena, and Tallahatchie.

THE MARKETING SYSTEM AND THE COTTON QUALITY PROBLEM

Over the years a highly refined and complex cotton marketing system has developed. The system as it exists today can be classified into two separate and distinct phases.

> "One deals with the transactions and activities involved in the transfer of ownership of cotton through purchases and sales, and the other deals with transactions and activities involved in the physical distribution of cotton. The former constitutes price bargaining, including both price and delivery terms. The latter constitutes the physical distribution of cotton and involves all the services necessary in making cotton of specific qualities and quantities available at specific times and places according to contract agreements. The two sides of cotton marketing are inseparable, for it is impossible to arrive at a price for cotton without an agreement or contract specifying the quantity and quality of it to be delivered and the time, place and terms of delivery."[3]

The two phases of cotton marketing are conducted in two major types of markets: **futures markets** and **"spot" markets.**

Cotton futures markets are centers in which trading is done in futures' contracts.[4] Although futures' contracts call for delivery of physical cotton at some future date, few contracts ever mature and involve delivery of physical cotton. The vast majority of futures' contracts are closed out by the execution of offsetting contracts before the delivery date. Since all futures' contracts must be liquidated with delivery of "spot" cotton or by offsetting contracts, the cotton futures markets cannot function apart from or independently of "spot" markets. Futures' markets are extremely important because it is in these markets that supply and demand are brought together establishing the price level for cotton.

"Spot" cotton markets are trading centers in which transactions calling for immediate delivery of physical cotton are made. In actual practice each bale of cotton usually is located in a warehouse and a bonded warehouse receipt is accepted by the buyer as evidence of existence of the bale of cotton. In most cases a bale of cotton remains in the warehouse of original storage until it is ordered shipped to a consuming mill. "Spot" cotton markets are of three types: (1) spinners' markets, (2) merchants' markets, and (3) farmers' markets.

As was pointed out above, individual producers usually market cotton in small lots of mixed quality while buyers for textile mills purchase relatively large lots of "even-running" quality. This marked difference in sales by producers and purchases by textile mills gives rise to the complex merchandising system which exists today. In moving through the system the cotton of individual producers is combined into larger and larger lots until finally assembled into "even-running" lots, usually of 100 bales.

The process of combining cotton into larger lots usually begins in farmers' markets. Typical buyers in the farmers' markets of the Upland area of Mississippi do nothing more than assemble cotton into mixed lots and subsequently sell to buyers in merchants' markets. Only rarely do they endeavor to assemble cotton into "even-running" lots for direct shipment to textile plants.

Assembling cotton into "even-running" lots that meet the needs of textile plants is a function that is performed by buyers in the merchants' markets. These are highly organized markets that do a complete job of merchandising cotton. The merchants and shippers in these markets are the contact points between farmers' markets and spinners' markets. They assemble cotton into "even-running" lots and ship to export or domestic mills.

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[3] Cox, A. B., **Cotton Demand Supply Merchandising**, (Austin, Texas, 1953), pp. 11-12.

[4] A futures contract calls for delivery of a specified quality (M 15/16 inch) but under rules of the exchange and provisions of the United States Cotton Futures Act other qualities may be delivered. The quantity designated by a futures contract is either 25,000 pounds or 50,000 pounds, depending upon the rules of the exchange. Cotton may be delivered at any one of several designated warehouses at the will of the seller.

Determining Value

At any given time the base price of cotton is set by trading on the futures' markets (primarily the New York Cotton Exchange). This base price applies to middling 15/16 inch cotton delivered to certain designated warehouses located at Atlantic and Gulf ports. The "spot" price of middling 15/16 inch cotton in "spot" cotton markets reflects primarily the futures price adjusted for carrying charges (storage, insurance, interest, and risk elements) between time periods and for transportation differentials between areas. Actual "spot" prices may vary from the adjusted futures price because of differences in the character of cotton sold in the "spot" market or because of market imperfections.

In any "spot" market the value of qualities other than the base quality is determined by adding points (100 points equal one cent) for better qualities and subtracting points for poorer qualities. The amount of the premium or discount paid for a particular quality is determined by the supply of and demand for that quality.

Determining the value of cotton is an extremely complex problem. The minimum requirements for accurate value determination are a knowledge of grade and staple,[5] of latest price quotations[6] and of discounts due to size and location of markets. See Appendix 1 on page 21 for examples that can be used as a guide in determining the value of cotton. Price determination by the methods illustrated in the examples is, at best, an approximation. This is true for at least two reasons:

First, both the base price (futures' quotation) and the premiums and discounts are subject to constant change. The cotton producer can usually obtain a current futures price quotation from some local radio station. Available quotations of premiums and discounts for different qualities are one, or more, days old. The price determined by using a current futures quotation and a day old, or older, quotation of premiums and discounts may differ appreciably from the actual market value on a given day.

Second, the price determined by the method illustrated is an approximation of the value in the Memphis market. Cotton sold in small farmers' markets is worth less than cotton of the same quality sold in Memphis. The reasons for this will be pointed out in the section of this bulletin entitled "Farmers' Markets."

The examples given in Appendix 1 are not recommended for general use by farmers. They are intended to serve as a guide for farmers who continue to sell cotton directly to buyers in farmers' markets, and to indicate the difficulty associated with price determination in local markets. In most cases the farmer would increase the net return from sale of his cotton if he utilized the services of a recognized sales agency in an organized market where current market quotations are available and where market prices are higher.

What the Producer Sells

Far too often the producer evaluates his cotton market only in terms of the level of price in the market. Such statements as "the market is 33 cents" are often misleading and, if accepted by the producer, may prove costly to him. The flat price quotation given as the local market price is usually the value of the average grade and staple being sold in the market at any one time. Better-than-average qualities are worth more; and, of course, poorer qualities are worth less.

Intelligent merchandising of cotton involves not only selection of a market where the level of prices is highest but also bargaining for maximum premiums and minimum discounts for qualities that are better than or poorer than middling 15/16 inch.

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[5] The U.S.D.A. will class cotton for the farmer without charge. Your County Agent can tell you how to obtain this service.

[6] Price quotations can be obtained from the sources indicated in Appendix 1.

Cotton Quality Is Important

If the marketing system reflects to producers the spinning value of specific qualities of cotton, production of a quality product becomes a matter of concern to producers. An examination of central market "spot" price quotations reveals the possible gain from producing cotton of higher grades and longer staples. Equally as important to the cotton producer are the substantial discounts levied against cotton of lower grades and shorter staples. Still further discounts result from improper ginning, in particular for those bales that are classed gin-cut.

Quite frequently two bales of cotton of the same grade and staple have different values to the spinner. This value differential usually is associated with differences in the character of the cotton lint. As has been pointed out, character is determined by quality characteristics other than grade and staple, the most important of which are strength, fineness, maturity, and uniformity of fibers.

If cotton is sold in such a way as to reflect the spinning value of specific qualities, the producer of cotton of high quality will be rewarded adequately.

How to Insure Quality

Although influenced to some extent by soil type and climatic conditions, staple length is primarily a varietal characteristic. Since climatic conditions are beyond the control of the producer and since the soil types on a given farm cannot be changed, the only means by which the producer can influence the length of staple produced is his choice of variety. Normally, the producer chooses a variety because of those agronomic characteristics that are closely associated with yield and gin "turn-out." Such a choice may not always be wise. The discount in price for a shorter staple may be a costly penalty for a slightly higher gin "turn-out" or a slightly increased yield. Moreover several varieties with similar agronomic characteristics may produce different staple lengths. Here again the choice of an inferior variety may prove costly.

The character of cotton lint is determined largely by the same factors that influence staple length. As is true with staple length, the producer has little control other than in his choice of variety. A variety should be chosen which produces lint possessing fiber characteristics desired by the users of the lint as well as possessing other desirable agronomic properties such as high yield or high percentage lint "turn-out."

Producers should consult their Extension cotton specialists and their county agents when selecting the variety to be planted. These men are well informed and are in a position to recommend varieties that possess desirable staple length and character in addition to other needed agronomic properties.

Grade is a different matter and can, to a great extent, be controlled by the producer. The major components of grade are color, amount of foreign material and preparation. Color is determined primarily by weather conditions and by the length of time that the open bolls are exposed to the elements. The amount of foreign material is affected by the length of time that open bolls are left in the field, by the way cotton is picked and handled, and by the way it is ginned. Preparation is a composite result of the condition of cotton when it arrives at the gin (primarily moisture content) and of the ginning operation.

Selection of an approved variety, timeliness of picking, care in picking and handling, and careful ginning will result in a finished product of high quality. Cotton of better quality, if properly marketed, will bring premium prices which will increase substantially the cash returns to producers.

BRIEF APPRAISAL OF TYPES OF "SPOT" MARKETS

As has been pointed out, the high degree of competition in spinners' markets results in prices which can be accepted as the true spinning value of cotton. Since this is true, it must be concluded that failure of the merchandising system to reflect true spinning values to producers is the result of merchandising practices in merchants' markets and/or farmers' markets.

Merchants' Markets

Merchants' markets are of two kinds. The type of merchants' market that is best known is the central "spot" market that is designated by the U.S.D.A. as a price reporting market. There are in addition to the designated markets many smaller and not-so-well known merchants' markets from which significant volumes of cotton of "even-running" quality are shipped directly to textile mills. From the standpoint of volume of cotton handled and services rendered, these smaller merchants' markets are of great importance to the cotton industry.

Merchants' markets are organized markets and differ markedly from farmers' markets in methods of operation and in organization. The distinguishing characteristics of merchants' markets are: (1) Buyers and sellers in the market are members of an exchange which defines and enforces trade practices. (2) The volume of cotton handled in the market is relatively large. (3) Significant proportions of the cotton handled are grouped into "even-running" lots for shipment to spinners' markets. (4) There are firms that specialize in selling cotton for others and receive a brokerage fee for their services.

Published price quotations are available for major spinners' markets and for many merchants' markets. Quotations for spinners' markets are for "even-running" lots delivered to mills while quotations for merchants' markets are for mixed lots delivered uncompressed in warehouses in the local area. Even though the price spread between spinners' markets and merchants' markets is wide, it appears to be in line with necessary marketing costs. In a recent study[7] it was found that, for the 1949-50 season, the average total marketing margin between Greenwood, Mississippi, and Group B Mill Points in the Carolinas was 190 points or $9.50 per bale. Of this total margin, $8.10 or 162 points was reported by Delta shippers as the average total cost of moving cotton to these mill points. This cost was made up of 83 points for transportation, 20 points for compression, 21 points for overhead, 18 points for merchandising services, 12 points for storage, insurance and other compress expense, and 8 points for bank expense. The difference of 28 points or $1.40 per bale between the total margin of $9.50 per bale and the total cost of $8.10 per bale was the return to the shipper out of which he had to recover the interest on his own capital, the cost of disposing of bales rejected by mills, losses in weight, assembly into "even-runnnig" lots, cost of arbitration and hedging, and risk, as well as the returns for his own services. This figure appears entirely reasonable and within the limits of what would be expected in competitive markets.

In a later study McLure and Fortenberry[8] found that (for the 1951-52 season) the average total marketing margin between Greenwood and Group B Mill Points in the Southeast was 206 points or $10.30 per bale. In that season transportation accounted for 91 points; overhead and profit, 47 points, and all other costs, 68 points. In this same study it was also found that (for the 1951-52 season) the total marketing margin between Memphis and Group B Mill Points in the Southeast was 208 points[9] or $10.40 per bale. Of this total margin, transportation accounted for 85 points: compression, concentration, interest and exchange, insurance, mill brokerage and miscellaneous expenses accounted for 79 points; and the margin for overhead and profit accounted for 44 points or $2.20 per bale.

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[7] Wells, Chester M., Jr. and Faught, William A., **Marketing Mississippi Delta Cotton,** Mississippi Agricultural Experiment Station, Bulletin 484.

[8] McLure, Joe H. and Fortenberry, A. J., **Cost In The Marketing of Cotton From Central Markets to Southeastern Mills,** U.S.D.A., PMA, Cotton Branch, Washington, October, 1953, p. 8.

[9] Ibid, p. 8.

Unpublished data available in the Department of Agricultural Economics, Mississippi Agricultural Experiment Station, reveal that prices in other merchants' markets in the Delta tend to follow Memphis and Greenwood prices very closely but are generally a few points below Greenwood. These lower prices would be expected because market values in these markets are lower. Market values are lower because (1) the volume of cotton sold is smaller, (2) the size of lots sold is usually smaller and (3) less cotton is sold in "even-running" lots.

All available data indicate that prices paid in Memphis, Greenwood and the smaller merchants' markets in the Delta generally reflect the spinning value of cotton, less necessary marketing costs and reasonable returns to cotton shippers. The small margins for overhead and profit indicate the competitive nature of these markets. It should be pointed out that competition is probably greater than these raw margins indicate because part of the margins is the result of the fact that prices for merchants' markets are for mixed lots while mill prices are for "even-running" lots.

The results of these studies support the belief, long held by members of the cotton trade and professional workers in agriculture, that prices received for cotton sold by sales agencies[10] in merchants' markets generally reflect the spinning value of specific qualities. Producers in the Delta have recognized this and have used the services of sales agencies. In 1949-50, for example, over one-half of the cotton sold by producers in the Delta was sold across the tables of commission firms.[11] On the other hand, producers in the Upland area have not utilized the services of brokerage firms, probably either because they did not know of these services or because they distrusted such distantly located marketing agencies.

Farmers' Markets

The average producer in the Upland area has a relatively small volume of cotton to offer for sale. Furthermore, the total volume of cotton produced in many local areas is small. The small volume of cotton handled in many farmers' markets causes the marketing services available to producers to be inadequate.[12]

If the producer sells in his local area, he generally must look to ginners, bankers, merchants and small-town buyers as market outlets. Many of these buyers are unable to determine the market value of individual bales of cotton on the basis of the quality factors—grade, staple, and character. Buyers experienced in the merchandising of cotton and who might provide efficient marketing services hesitate to locate in the small farmers' markets because of the small volume of cotton that is marketed.

To the extent that buyers in farmers' markets are unable to determine the market value of individual bales of cotton, the prices received by producers tend to differ from the spinning value of the specific quality sold. The buyer who is unable to determine accurately the value of a bale of cotton will normally discount the price in an attempt to reduce the risk associated with his uncertainty.

The inability of buyers to evaluate individual bales of cotton leads to the undesirable practice of purchasing "hog-round" or on the basis of average quality. This method of pricing fails to reward producers of cotton of better-than average quality, nor does it penalize producers of cotton of below-average quality. Generally, varieties of cotton of short staples produce larger yields and higher gin "turn-out." If the marketing system does not reflect penalties for short staples, farmers will tend to produce these varieties. Furthermore, if premiums are not paid for high grades, there is no incentive for the farmer to handle his cotton carefully and to see that it is ginned properly. To the extent that "hog-round" buying is practiced in farmers' markets the marketing system causes the cotton quality improvement work of State and Federal agricultural agencies to be less effective.

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[10] Sales agencies are usually called factors. In effect they are commission firms, either private or cooperative.

[11] Wells, Chester M., Jr., and Faught, William A., **Marketing Mississippi Delta Cotton,** Mississippi Agricultural Experiment Station, Bulletin 484, p. 4.

[12] For an appraisal of buying practices in the Upland area of Mississippi see: Wells, Chester M., Jr., **A Comparison of Marketing Practices In Organized and Unorganized Cotton Communities In Mississippi,** Master's Thesis. Mississippi State College, May 1949; and Faught, William A., **Cotton Marketing Practices In Selected Communities, 1947-48,** Southern Cooperative Series, Bulletin No. 8, September, 1950.

The small number of buyers in farmers' markets, where the volume of cotton marketed is small, is an indication of a lack of competition among buyers. The lack of effective competition among buyers, even in those cases where buyers are able to properly evaluate each bale, usually results in prices which are below the actual local market value.

To this can be added the fact that the value of cotton sold in local markets is less than the value of a comparable bale sold in a larger, more highly organized market. This is true because the small volume of cotton handled results in higher costs per bale handled. In other markets where the volume of cotton handled is larger, buyers are able to take advantage of economies of scale and reduce costs per bale.

The marketing practices of producers tend to aggravate the inadequacies of local markets. In previous studies[13] it was found that a large percentage of producers interviewed only one buyer prior to sale. Because of the limited number of buyers in many local markets, this will usually be true if the producer confines his sales to these markets.

It was found that many producers followed the practice of selling cotton immediately after it was ginned. The reasons most frequently given for immediate sale were that it was customary or was necessary to meet immediate obligations. This custom is costly and should be changed. The producer should extend his credit commitments long enough to permit effective merchandising of his cotton.

Immediate sale of cotton necessitates sale on gin weights. Sale on gin weights is undesirable for at least two reasons: First, gin weights are in many instances inaccurate. This is shown by differences in gin weights and bonded warehouse weights. Second, the producer who sells on gin weights is necessarily limited to sale in his local market. The producer should in all cases have his cotton delivered to a bonded warehouse and should sell his cotton on the basis of a warehouse sample and a bonded warehouse weight. Even if the producer sells in his local market on the basis of gin weights, he still has to bear the cost of delivery to a warehouse plus a receiving charge and storage for one month. The first buyer recognizes these costs as merchandising costs and shifts them to the producer. In addition to being assured of an accurate weight the producer who stores cotton in a bonded warehouse is no longer limited to sale in his local market. If he has a warehouse sample and a warehouse receipt, he is no further from a recognized sales agent in an organized market than he is from his mail box. Storage of cotton in a bonded warehouse prior to sale is a major step in the direction of improved marketing.

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[13] For an appraisal of selling practices of farmers in the Upland area of Mississippi see: Wells, Chester M., Jr., **A Comparison of Marketing Practices In Organized and Unorganized Cotton Communities In Mississippi**, Master's Thesis, Mississippi State College, May 1949; and Faught, William A., **Cotton Marketing Practices In Selected Communities, 1947-48**, Southern Cooperative Series, Bulletin No. 8, September, 1950.

COTTON DEPARTMENT OF MISSISSIPPI FEDERATED COOPERATIVES (AAL)

Even though there are only a limited number of competitive merchants' markets in the Upland area of Mississippi, there are opportunities for the producer in the area to avail himself of adequate merchandising facilities. With a bonded warehouse receipt he can sell through a sales agency in any merchants' market. If he does not choose to sell through a sales agency in one of the older, more widely recognized merchants' markets, he still may divorce himself from farmers' market conditions by selling through a cooperative. Mississippi Federated Cooperatives (AAL) is one such cooperative outlet.

Marketing Services

Since the beginning of the cotton marketing operation in the 1940-41 season, Mississippi Federated Cooperatives has provided several marketing services to producers. These may be described briefly as follows:

(1) The cooperative will receive cotton from producers and place it in the so-called "optional pool." Here the cotton remains until the producer decides what to do with it. If the producer so desires, he may obtain a cash advance against cotton entering the "optional pool." If a cash advance is made, interest at 4 percent is charged.

(2) The cooperative will sell "spot" cotton for producers. Under this arrangement, bids are obtained from buyers and sales are made to the highest bidder. A nominal fee (usually $1.00) is charged for this service.

(3) The cooperative will purchase cotton and loan equities from producers and will purchase cotton from cotton buyers. This cotton is then sold for the best price obtainable.

(4) The cooperative will place cotton in the Government loan for producers. The cooperative will also withdraw cotton from the Government loan and purchase the farmer's equity or return the warehouse receipt to the producer or his authorized agent.

In the 1940-41 season, the only services offered by Mississippi Federated Cooperatives were the direct purchase of and the placing of cotton in the Government loan. Since that time the four different services described in the preceding paragraph have been offered continuously.

Farmer patrons might utilize any one or more of these services in disposing of a single bale of cotton. For example, a bale might be placed in the optional pool, be transferred later to the Government loan and subsequently be purchased by the cooperative.

The most apparent advantages offered by the cooperative are expert classing and expert marketing. Each bale of cotton is properly classed and is sold on the basis of quality characteristics. Bargaining between the sales force and buyers is keen and prices received reflect the value of specific qualities sold.

The most apparent disadvantage associated with the activity of the cooperative is the outright purchase of cotton. Even if cotton is hedged against price drops, risk exists and, in some years, losses are almost certain to occur. Any losses thus incurred must be absorbed by those producers who use the cooperative as a sales agency. On the other hand, such producers may gain from outright purchase by the cooperative because of higher prices normally resulting from the larger volume of cotton sold. Further gains may be experienced as the result of patronage refunds paid from earnings made on purchased cotton.

Use by Farmers

Since its organization the cotton department of Mississippi Federated Cooperatives has maintained facilities for handling a large volume of cotton. As indicated above it also has attempted to appeal to producers by offering a variety of merchandising services. Although facilities and services have been more than adequate, producers have disposed of a relatively small portion of their total production through Mississippi Federated Cooperatives, Table 1. Moreover, the extent to which producers in the various districts have utilized the facilities has varied sharply. Districts 1 and 4 which constitute the Delta and which had the largest volume of cotton produced, marketed the smallest proportion of their production through Mississippi Federated Cooperatives. This small volume from the Delta is normal because the cooperative has made no conscious effort to solicit patronage from the area. The most important sources of cotton handled by Mississippi Federated Cooperatives have been District 5, Central Mississippi, and District 3. Northeast Mississippi. The data in Table 1 give an indication of the areas of greatest opportunity for expanded service by Mississippi Federated Cooperatives. The crop reporting districts indicated in Table 1 are outlined in Chart 1.

A highly significant factor affecting the operation of the cotton department has been the marked variation in number of bales handled which has ranged from 5,579 bales in 1950-51 to 123,260 bales in 1948-49. In addition to causing per-bale costs to fluctuate violently from year to year, this variation in volume has tended to reduce the number of buyers operating in the Jackson market.

Table 1. Cotton production, bales handled by Mississippi Federated Cooperatives (AAL) and bales handled as percent of production, by crop reporting districts in Mississippi for the twelve year period 1940-41 through 1951-52.

District	Bales produced in 12-year period*	Bales handled by MFC in 12-year period**	Bales handled by MFC as percent of production
			Percent
1	5,241,823	6,517	0.1
2	2,040,023	40,015	2.0
3	1,449,753	144,539	10.0
4	5,476,109	13,802	0.2
5	1,605,565	169,350	10.5
6	1,229,607	70,598	5.7
7	831,459	53,536	6.4
8	999,142	51,058	5.1
9	474,625	60,241	12.7
Total	19,348,106	609,656	3.2

*Computed from: Heidelberg, L. C., "Cotton Estimates by Counties," U.S.D.A. Bureau of Agricultural Economics. Office of the Agricultural Statistician, Gulfport, Mississippi. Mimeographed report for the years 1940 through 1951.

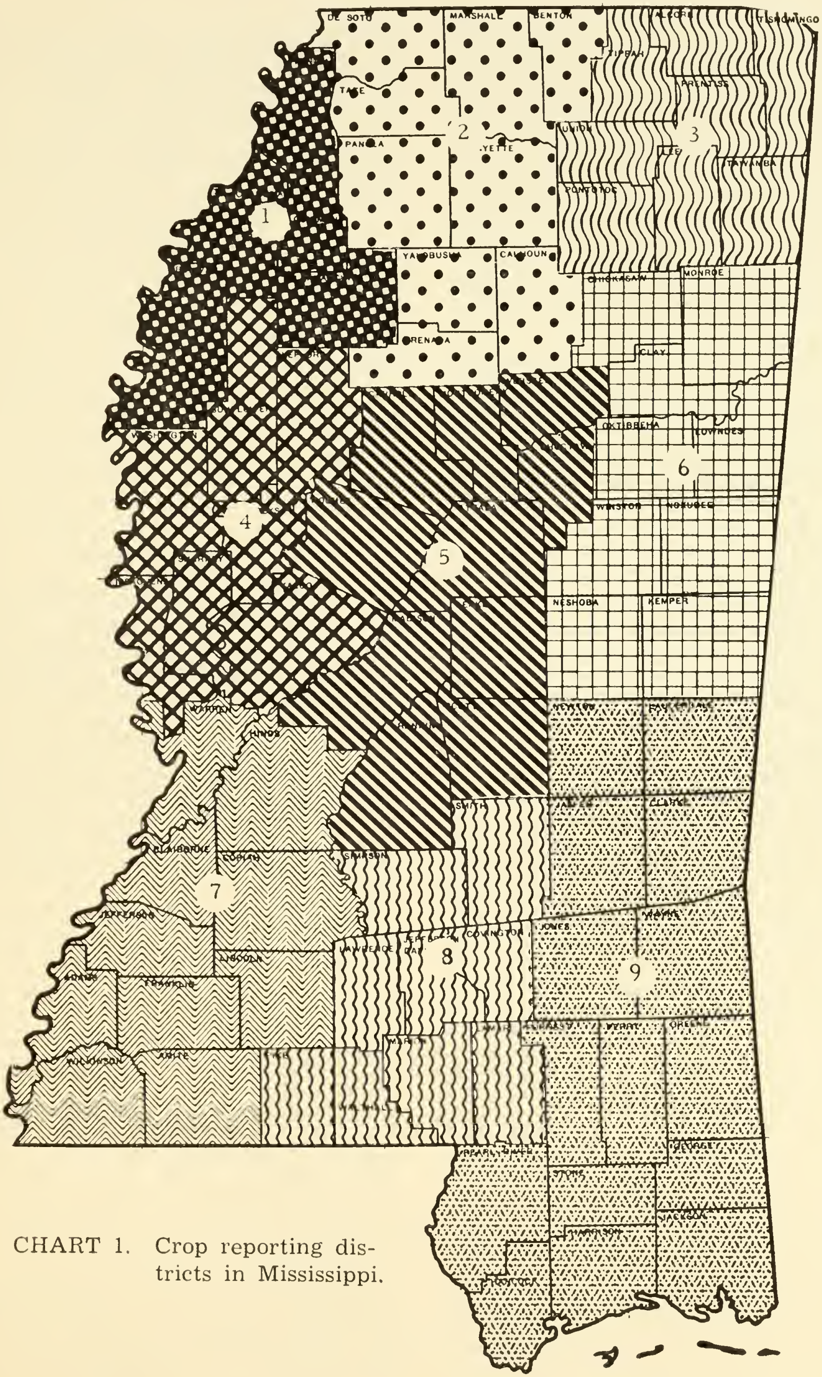
**Number of bales handled differs from number of bales received because some bales were handled in more than on way. See section entitled "Marketing Services" for a description of methods of handling cotton.

It is apparent that farmers have failed to realize fully the potential benefits from marketing through the cotton department. Farmers have not used the cotton department consistently as a merchandising agency but have used it primarily as a means of placing cotton in the Government loan. In years when cotton prices have not been near the support level, producers have followed the traditional practice of selling to local buyers and have not utilized the services offered by their cooperative.

Cost of Operation of Cotton Department

Nature of Costs. Most cotton merchandising firms have relatively high fixed or overhead costs. In nearly all firms, expense items of a fixed or overhead nature make up the major portion of total operating costs. This is particularly true of those firms which specialize in rendering marketing services for producers and do not make direct purchases of any appreciable volume of cotton. A firm of this type, in order to operate efficiently, must keep its per-bale operating cost relatively low. With high fixed cost, low per-bale cost can be achieved only if facilities are utilized at or near capacity.

Maintenance by Mississippi Federated Cooperatives of the personnel and physical facilities necessary to handle a large volume of cotton and to provide adequate marketing services has resulted in rather high cost of an overhead nature. In each year, wages and salaries have been by far the most important expense items. Other fixed items of expense, such as rent, communications, and office expense have contributed materially to the cost of operation. The one major expense which had some of the characteristics of a variable cost item has been insurance. In two seasons, 1943-44 and 1944-45, insurance costs were significantly larger than average. In these two seasons Mississippi Federated Co-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JASPER
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CLAIBORNE
COPIAH
SIMPSON
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JEFFERSON
JONES
WAYNE
LAWRENCE
JEFFERSON DAVIS
COVINGTON
8
LINCOLN
ADAMS
FRANKLIN
9
PERRY
GREENE
WILKINSON
AMITE
PEARL RIVER
GEORGE
STONE
JACKSON
HARRISON
HANCOCK

CHART 1. Crop reporting districts in Mississippi.

operatives purchased relatively large volumes of cotton and the increase in insurance expense was primarily the result of insurance paid on this cotton.

Variation of Costs. The total operating cost of the cotton department has risen about in proportion to the general inflationary conditions that have prevailed during its period of operation. In some years total operating costs have varied significantly from the rising trend. These variations have been associated with widely varying volumes of cotton handled. In years when the volume of cotton handled has been small, total operating cost has tended to be low. In years when the volume of cotton handled has been large, total operating cost has tended to be high. This indicates that, even though overhead costs are of major importance, there are certain expense items that vary directly with volume.

The effect of varying volume on per-bale cost has been different from that on total cost. Rather than tending to vary directly with volume as has total cost, per-bale cost has varied inversely. In addition to varying inversely with volume, per-bale cost has varied more than proportionately. The years of extreme variation in volume of cotton handled illustrate quite clearly the importance of the effect of changing volume on both total cost and per-bale cost. In 1948-49 the cotton department handled 123,260 bales of cotton. Total operating cost in this season was $88,968.68, while per-bale cost was only 72 cents. In contrast, in 1950-51, only 5,579 bales were handled at a total cost of $66,662.27 and per-bale cost of $11.95.

Income of Cotton Department

Sources of Income. Similar to any other organization that handles cotton on a brokerage basis, Mississippi Federated Cooperatives has made certain per-bale service charges. Charges have been assessed for selling cotton and for placing cotton in the Government loan. Cotton usually has been pledged to the Government loan through a county cooperative. In this event the county cooperative received 50 cents and Mississippi Federated Cooperatives received 75 cents of the total $1.25 per-bale service charge.

Additional income has resulted from the purchase and subsequent sale of cotton and of loan equities. The amount of income resulting from such transactions has, of course, been determined by the volume of sales, by market prices, and by the effectiveness of the sales staff.

As was pointed out earlier, producers have tended to use the services of Mississippi Federated Cooperatives in years when market prices have been near support prices. This has influenced greatly the amount of income that has resulted from the performance of different merchandising services. Most of the revenue that has been received has been the result of loan placements. In most years, the most important sources of revenue have been loan placements and withdrawals and purchase and sale operations. Actually, loan placements have, to a great extent, made possible income from merchandising operations. Usually when cotton was placed in the loan, the cooperative eventually had an opportunity to make withdrawals and purchase equities for subsequent sale.

In most seasons, interest has proven to be an additional source of income. Interest at 4 percent has been charged on cash advances made to producers. The net rate of interest accruing to the cooperative has been one-half of one percent or less.

Variation of Income. The volume of cotton handled and gross revenue have varied directly. In years when volume of cotton handled has been small, total revenue has been low. When the volume handled has been large, total revenue has been high. The relationship between changes in volume of cotton handled and changes in total revenue has not, however, been in direct proportion. This has been true primarily because income from purchase and sale operations has not been influenced as much by volume as by differences in purchase price and sale price.

Net Earnings. Total net earnings have been a result of total operating cost and total revenue both of which have been affected by the volume of cotton handled. As a result of the relationship between volume of cotton handled, total operating cost, and total revenue, total net earnings have tended to be greater in years when volume of cotton handled has been large.

As was pointed out above, the charges which Mississippi Federated Cooperatives has made for rendering different marketing services have been fixed, that is, the charge has been a specified amount per bale for each service rendered. Since the income from handling cotton has come from fixed charges per bale,[14] it has been necessary that per-bale handling cost be kept below per-bale revenue so that losses would not be incurred. In each of the years included in this study, per-bale handling cost has been kept below per-bale revenue and net earnings have been experienced.

Returns to Producers

The returns which have accrued to producers who have utilized the marketing services offered by Mississippi Federated Cooperatives have been the result of prices received and of patronage refunds. To the extent that prices received for cotton marketed through the cooperative have been higher than prices that could have been received through farmers' market outlets, producers who have sold through the cooperative have received larger incomes. The incomes of producers have been further increased as a result of earnings of the cotton department; earnings which have been rebated as patronage refunds.

Prices Received. For purposes of determining whether or not Mississippi Federated Cooperatives sold cotton for prices in line with its value, data were collected for 154 lot sales made from November, 1951 through July, 1952. For each lot, the data collected included the average price received, the number of bales of each grade and staple and the date of sale. The Memphis value of each lot was then determined on the basis of Memphis quotations for each grade and staple. This was done by use of a weighted average in which the Memphis quotation for each grade and staple was multiplied by the number of bales of each grade and staple, the products totaled and the sum divided by the total number of bales in the lot.

Examination of individual lot sales revealed that only a very few bales, brought prices appreciably below their Memphis evaluation. All other sales were made at prices above or only a few points below Memphis values. The data clearly revealed that prices received generally reflected the values of different qualities.

The results of comparing prices received to Memphis values, summarized for each month as well as for the season, are shown in Table 2. Prices received by Mississippi Federated Cooperatives for 21,261 bales of cotton sold during the nine-month period average only .02 cents per pound less than the weighted average Memphis evaluation. Since, as was pointed out above, the value of cotton sold in small markets is normally expected to be less than the value of comparable qualities sold in larger markets, the narrow spread between Memphis values and prices received by Mississippi Federated Cooperatives was surprising. The data indicate clearly that the sales department of Mississippi Federated Cooperatives has served its patrons well by selling their cotton effectively.

Patronage Refunds. As was pointed out above the cotton department has experienced net earnings in each year of operation included in this study. These earnings have been returned to patrons in the form of a patronage refund. Such refunds have been paid in eleven of the twelve years, Table 3.

For years in which refunds were paid, the average per-bale rebate ranged from 29 cents in 1944 to $2.01 in 1947. During the twelve-year period an average refund of 66 cents was paid on each of the 609,656 bales of cotton handled in different ways by the cooperative. The amount of the patronage rebate per bale has been related to the number of services performed for the producer and to the cost of the cooperative of performing these services. For example, in the 1947-48 season when the average rebate was $2.01, the rebate on individual bales ranged from 22 cents to $3.40. If producers had utilized more completely the services of the cotton department, rebates would have been larger in many years because the increased volume would have permitted more efficient operation and earnings would have been larger.

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[14] This has not been true for cotton purchased outright and subsequently sold. The income from this cotton was determined by the difference in purchase price and sales price less direct marketing costs.

Patronage refunds are incidental to the marketing program of Mississippi Federated Cooperatives and should not be the deciding factor in whether or not a farmer becomes a patron. At best, if the cooperative assessed a service charge of $1.00 and operated without cost, the refund could only be $1.00. The real basis of choice should be the service offered. If the producer feels that his farmers' market does not return the market value of his product, payment of $1.00 for marketing services that would return market value would be money well spent.

Table 2. Weighted average spread between Memphis equivalent values and prices received by Mississippi Federated Cooperatives, by months and for the season.*

Month of sale	Number of lots	Number of bales	Amount Memphis value exceeded price rec. by MFC
			(Cents per lb.)
November, 1951	10	3,243	.16
December, 1951	16	4,522	.13
January, 1952	23	3,243	—.24**
February, 1952	18	1,255	—.36
March, 1952	19	1,873	—.49
April, 1952	23	5,357	.03
May, 1952	9	290	.59
June, 1952	20	963	.62
July, 1952	16	515	1.20
Season total	154	21,261	.02

*Spread for individual lots determined by subtracting price received by Mississippi Federated Cooperatives from Memphis equivalent value of each lot. Average spread then determined by weighting the spread for each lot by the number of bales in the lot.

**Negative spreads resulted when the price received by Mississippi Federated Cooperatives was above Memphis value.

Table 3. Average patronage rebate per bale handled by Mississippi Federated Cooperatives, 1940-41 through 1951-52.*

	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	Ave.
Refund per bale (dol.)	.45	.94	.68	.38	.29	.70	1.44	2.01	.56	.44	**	1.67	66

*Average rebate computed by dividing total rebate by the number of bales handled. In most years, the rebate on individual bales of cotton differed from the average rebate because of different amounts of services and different costs of handling cotton in different ways.

**In 1950 the cooperative paid to producers a 20 cent per-bale rebate on 89,335 bales of cotton. This was not related to activity of the 1950-51 season but was a distribution of money allocated to farmers by Commodity Credit Corporation after sales of 1948-49 loan cotton.

APPENDIX

Price Determination

In order to determine the value of a bale of cotton, the farmer needs to know two things: the quality of the cotton and the price which that quality commands. Recognizing the desirability of a well-informed farm population Congress took steps to make quality and price information available to farmers. The Smith-Doxey program of the U.S.D.A. will provide to farmers, without charge, grade and staple information for each bale. The Market News Service of the U.S.D.A. submits price quotations to local radio stations and to daily and weekly newspapers. In addition to reporting prices by radio and newspaper, the U.S.D.A. releases a weekly cotton market review and reports daily price quotations. The producer can receive these published reports by requesting the **Weekly Cotton Market Review** and **Cotton Quotations —Ten Designated Markets.** He should address his request to United States Department of Agriculture, Agricultural Marketing Service, P. O. Box 8074, Crosstown Station, Memphis 4, Tennessee.

By using the Smith-Doxey classing service and price quotations from any of the above mentioned sources, the producer can arrive at an estimate of the value of cotton in his local market. The purpose of this appendix is to illustrate the procedure for estimating the value of cotton by use of the weekly and daily published reports of the U.S.D.A.

It should be emphasized that price determination by the methods illustrated is at best an approximation. This is true for two reasons: first, due to the time lag in receipt of price quotations, the producer does not have up-to-the-minute price data; and second, the prices reported apply to designated "spot" markets, in this area to Memphis. For the reasons given in the text of this bulletin, cotton is worth more in merchants' markets than in farmers' markets. For these reasons, the examples given below are not recommend for general use by producers. They are intended to serve as a guide for producers who continue to sell cotton directly to buyers in farmers' markets, and to indicate the difficulty associated with price determination in farmers' markets.

Farmers who sell their cotton to buyers in farmers' markets should make every effort to determine the value of each bale before it is sold. In using the methods described below the producer should always use the very latest available price quotations for both futures and premiums and discounts.

It will be observed in the two examples that follow that the Memphis values determined by the use of weekly and daily quotations are slightly different for the same day. This should not be a matter of concern to the producer. The difference is negligible and is explained by differences in the methods of averaging prices for purposes of daily quotations and weekly summarization.

Example 1: Determination of value of cotton by use of prices reported in the **Weekly Cotton Market Review.** This price report is released on Friday of each week. Usually it takes at least two days for the release to reach rural box holders, consequently it would not be available for use by farmers before Monday of the next week.

The prices used in this example were taken from the **Weekly Cotton Market Review** of February 26, 1954. The Memphis quotations from this release are reproduced in Table 1.

Table 1. Cotton price quotations, Memphis, Tennessee, Thursday, February 25, 1954. (Quotations are based on New York May futures which closed on Thursday, February 25 at 34.26c).

Staple lengths	Grade			
	SM	M	SLM	LM
Inches	Points	Points	Points	Points
1/8	—170	—195	—370	—700
29/32	— 95	—120	—290	—620
15/16	— 20	— 45	—220	—575
31/32	+ 10	— 15	—165	—525
1	+ 55	+ 20	—130	—475
1-1/32	+125	+ 75	— 75	—425
1-1/16	+175	+125	— 50	—390

Source. **Weekly Cotton Market Review,** February 26, 1954.

With no source of information other than the **Weekly Cotton Market Review,** a producer may estimate the Memphis value of a particular quality of cotton. Suppose that the producer had a bale of cotton which, according to his Government class card, was middling 15/16 inch. Suppose further that on Monday morning, March 1, he found the **Weekly Cotton Market Review** in his mail box. The Memphis value of the middling 15/16 inch bale can easily be determined as follows:

May New York futures closed February 25	34.26c
Discount for middling 15/16 inch	—.45
Memphis price	33.81c

This price of 33.81 cents was the value of middling 15/16 inch cotton in Memphis on the afternoon of February 25, 1954. The Memphis price may have been different and probably was different on Monday, March 1. This is true for two reasons: first, the discount for middling 15/16 inch cotton may have changed and second, the futures price may have changed. Actually the **Memphis price** of middling 15/16 inch on **March 1** ranged from **33.70** cents to **33.83** cents. This was true because the discount for middling 15/16 inch had increased to 56 points and the futures ranged from 34.26 cents to 34.39 cents.

An estimate of the Memphis value of any other quality of cotton can easily be made. For a bale of strict middling 1-1/32 inch cotton the value would be determined as follows:

May New York futures closed February 25	34.26c
Premium for strict middling 1-1/32 inch	1.25
Memphis price	35.51c

This price of 35.51 cents was the value of strict middling 1-1/32 inch cotton in Memphis on the afternoon of February 25, 1954. On Monday, March 1, the price of this quality of cotton actually ranged from 35.40 cents to 35.53 cents.

Example 2. Determination of value of cotton by use of prices reported in **Cotton Quotations — Ten Designated Markets.** This price report is released daily, Monday through Friday. As is true for the **Weekly Cotton Market Re-**

Table 2. Cotton Quotations—Ten Designated Markets, February 25, 1954.*

	Chlstn.	Aug.	Atl.	Montg.	N.O.	Mem.	L.R.	Dallas	Hous.	Gal.
M 15/16″										
cents lb.	34.25	34.75	34.45	34.25	33.80	33.80	33.75	33.90	33.75	33.75
Sales reported	0	430	61	86	1,008	8,196	656	8,149	4,208	100

PREMIUMS AND DISCOUNTS—in hundredths cents per pound

Staple	Grade						
	GM	SM	M	SLM	LM	SGO	GO
7/8	—115	124	150	325	655	870	960
29/32	— 40	50	75	245	575	780	930
15/16	+ 35	25	B	—175	530	730	830
31/32	+ 65	55	30	—120	480	700	785
1	+110	100	65	— 85	430	655	755
1-1/32	+180	170	120	— 30	380	630	755
1-1/16	+230	220	170	— 5	345	605	755
1-3/32	+300	280	230	55	—320	595	745
1-1/8	+435	425	350	125	—295	595	745
1-5/32	+685	675	550	215	—270	595	745
1-3/16	+910	900	750	340	—260	595	745
1-7/32	+1,155	1,140	990	450	—250	595	745
1-1/4	+1,415	1,400	1,200	600	—240	595	745

Source: **Cotton Quotations—Ten Designated Markets,** February 25, 1954.

*Premiums and discounts shown only for white cotton in Memphis.

view, this report ordinarily does not reach rural box holders until the second day after its release.

The prices used in this example were taken from **Cotton Quotations—Ten Designated Markets** released on February 25, 1954. Memphis quotations for a limited number of grades and staples are reproduced in Table 2.

Suppose that on Monday, March 1, 1954, a producer wished to sell a bale of middling 15/16 inch cotton and that he had no source of price information other than the February 25 daily price quotations. He could determine the Memphis price simply by reading it from the list of quotations of middling 15/16 inch at the top of the quotation sheet. **This price of 33.80 cents was the value of middling 15/16 inch cotton in Memphis on the afternoon of February 25, 1954.** This, of course, only approximates the Memphis value on March 1, 1954. As was indicated in the previous example, the **Memphis price** of middling 15/16 inch on **March 1** actually ranged from **33.70** cents to **33.83** cents.

Estimates of Memphis values of other qualities are made somewhat differently than in the previous example. The value of strict middling 1-1/32 inch could be determined as follows:

Memphis price of middling 15/16 inch February 25	33.80c
Premium for strict middling 1-1/32 inch	+1.70
Memphis price	35.50c

Once again this price only approximates the price of this quality on March 1. As was shown in the previous example, the price of strict middling 1-1/32 inch ranged from **35.40** cents to **35.53** cents in **Memphis** on **March 1.**

m63b

BULLETIN 518 APRIL 1954

AN ECONOMIC APPRAISAL OF *Beef Production* IN SOUTH MISSISSIPPI

MISSISSIPPI STATE COLLEGE
AGRICULTURAL EXPERIMENT STATION
CLAY LYLE, Director
STATE COLLEGE MISSISSIPPI

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ACKNOWLEDGEMENTS

This is one of a series of studies dealing with the economics of livestock production on Mississippi farms. Other studies include: sheep, hogs, poultry, and milk production.

Appreciation is extended to Dr. R. J. Saville, Head, Department of Agricultural Economics, Mr. Henry Leveck, Associate Director of the Mississippi Agricultural Experiment Station, Mr. Paul Newell, Leader in Extension Animal Husbandry, and Mr. H. P. Todd, Statistical Analyst, for suggestions in the organization and development of the study. Dr. Saville, Mr. Newell and Mr. C. E. Lindley, Head, Department of Animal Husbandry, read the manuscript and made many helpful suggestions. Dr. L. N. Wise, Professor of Agronomy, Dr. W. L. Giles, Superintendent Delta Branch Experiment Station, Dr. W. B. Andrews, Professor of Soils, and Mr. W. R. Thompson, Extension Agronomist, gave many helpful suggestions relating to methods of calculating pasture costs and of presenting pasture data.

Special appreciation is expressed to the 104 beef cattle owners in the area who provided information for the study. Without their cooperation, this study would have been impossible.

Mr. P. T. Blair, Mr. A. F. Estes, Mr. J. H. Montgomery and Mr. A. D. Seale, graduate students in the Department of Agricultural Economics, collected most of the farm data. Mr. D. L. Pritchard, senior student in the Department of Agricultural Economics, tabulated much of the data.

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AN ECONOMIC APPRAISAL OF BEEF PRODUCTION IN SOUTH MISSISSIPPI

By D. W. PARVIN

The Problem: Beef production has been increasing in importance in Mississippi for a number of years. Forty-four percent more beef was produced on Mississippi farms in 1951 than in 1941.[1] A decline in the farm labor supply, the accompanying shift from row crops to pasture and forage crops, relatively low labor requirements for beef production and comparatively high prices for beef for a number of years are the major factors contributing to the increase in beef production in the state.

It is expected that the production of pasture and forage crops will continue to increase as farmers follow better land use programs and adopt improved practices in forage production. Also, it is likely that the demand for meat will continue at a relatively high level and there will continue to be a shortage of farm labor. Therefore, the sale of beef animals should continue to be one of the major sources of farm income in Mississippi. Relatively inexperienced beef producers and those contemplating adding a beef enterprise to their present farming system need basic information on which to base their decisions. This study was designed to provide this type of information relating to beef production in South Mississippi, particularly the following:

1. Resources used in beef production and investment required.
2. Cost and return involved.
3. Management practices used and their effect on costs and returns.
4. Weakness in present management practices and ways by which beef production can be made more profitable.

Method of Study: Data for the study were obtained by personal interview with 104 producers in South Mississippi. The farms were located in Claiborne, Jones, Marion, and Yazoo Counties. A list of beef cattle producers was secured from the Agricultural Extension Service and supplemented by agricultural workers in each county. Insofar as possible,[2] all beef producers were interviewed who owned ten or more beef cows or sold ten or more beef animals during the year studied. Schedules were not obtained from those producers who were also cattle traders. Detailed information, with regard to all phases of the beef enterprise, was obtained for the year ending June 30, 1951.

In order to determine the extent to which the soil area influenced production practices, two major soil areas, (Brown Loam and Longleaf Pine) were studied separately. Sixty-nine of the farms studied were located in the Brown Loam and 35 in the Longleaf Pine. Methods used in calculating investment, cost and returns are given in Appendix I.

System of Farming

Land Use: Because of the extensive nature of the enterprise, beef cattle farms are larger than most other types of farms. The farms studied averaged 556 acres, compared to an average of less than 160 acres for all farms in South Mississippi.[3] Farms studied were much larger in the Brown Loam than in the Longleaf Pine,

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[1] Agricultural Statistics, U. S. D. A., 1942 and 1952.

[2] If a schedule was not obtained in three visits to a farm, that producer was dropped from the sample.

[3] Estimation based on Census of 1950.

704 acres compared to 265 acres (Appendix Table 1).

In each area the land on the farms studied was almost equally divided between open land and woodland. Of the open land about 60 percent was used for permanent pastures in the Brown Loam and about 70 percent in the Longleaf Pine. About three-fourths of the woodland was pastured in each area.

Cropping Pattern: Corn, cotton and hay and seed crops were the principal crops and accounted for an average of 93 percent of the cropland on the farms studied; corn was grown on 42 percent of the cropland, cotton on 29 percent, and hay and seed crops on 22 percent (Appendix Table 2). Due to differences in soil and climatic conditions, a larger proportion of the cropland was used for cotton and a smaller proportion for the production of seed and hay crops in the Brown Loam than in the Longleaf Pine. The amount of cropland per farm averaged 141 acres in the Brown Loam, 41 acres in the Longleaf Pine, and 107 acres for all farms.

Livestock System: In addition to the beef enterprise, other livestock enterprises of commercial importance were found on 46 percent of the farms studied in the Brown Loam but on only 6 percent of those in the Longleaf Pine (Appendix Table 19). Hogs were produced commercially on 45 percent of the farms in the Brown Loam and sheep on 1 percent. In the Longleaf Pine, hogs and eggs were each produced commercially on 3 percent of the farms.

Beef cattle herds were much larger in the Brown Loam than in the Longleaf Pine. The number of cows per farm averaged 53 in the Brown Loam and 25 in the Longleaf Pine (Appendix Table 10). The average for all farms studied was 43.

Farm Labor Supply: Including the operator, there was an average of three persons per farm in the family labor force in the Brown Loam and 2.8 in the Longleaf Pine (Appendix Table 7). There were about the same number of males and females and about three-fifths of the family labor force were between the ages of 18 and 60.

Operators of beef cattle farms in the Brown Loam were, on the whole, older than those in the Longleaf Pine. More of them were over 60 years of age and fewer were under 40 (Appendix Table 8). In each area more than half of the operators were between 40 and 60 years of age. Operators in the Brown Loam were more experienced in beef production than those in the Longleaf Pine. They had produced beef commercially an average of 18 years compared to an average of only 7 years for the operators in the Longleaf Pine.

Farm Equipment: Tractors were found on 72 percent of the farms studied in the Brown Loam and on 89 percent in the Longleaf Pine (Appendix Table 3). Equipment used primarily for the production and harvesting of forage crops was found as follows: Mowers on 69 percent of the farms, rakes on 39 percent, lime spreaders on 33 percent, grain drills on 19 percent, cultipackers and combines each on 16 percent, balers on 9 percent and ensilage cutters on 5 percent.

Farm Buildings: The general barn was used in connection with the beef enterprises on 80 percent of the farms studied, hay barns on 10 percent, temporary shelters on 3 percent, and other buildings on 10 percent (Appendix Table 4). A slightly larger proportion of the producers in the Brown Loam reported the use of each type of building than in the Longleaf Pine.

Management Practice

Pastures: Although there was considable variation in acreage of pasture per cow between individual farms, there was little variation between averages for the areas. Open permanent pastures used per cow averaged 3.2 acres in the Brown Loam and 3.6 acres in the Longleaf Pine; temporary winter pasture averaged .3 acres and .4 acres per cow; and woodland pastures averaged 4.1 acres and 4.2 acres per cow in the Brown Loam and Longleaf Pine, respectively (Appendix Table 31). In addition to the grazing secured from pastures, most producers utilized the forage available on cropland after crops had been harvested. Acres of cropland per cow averaged 2.7 in the Brown Loam and 1.7 in the Longleaf Pine.

All or part of the open permanent pastures had been improved[4] on 77 percent of the farms studied. Approximately one-half of the total acreage of open permanent pasture in the Brown Loam was improved and about two-thirds in the Longleaf Pine. A complete job of improvement (land preparation, fertilization, and seeding) had been done on 40 percent of the improved permanent pastures in the Brown Loam and on 52 percent in the Longleaf Pine (Appendix Table 26). The proportion of improved permanent pastures that was improved by land preparation, seeding or fertilization or a combination of two of these practices averaged 44 percent in the Brown Loam and 22 percent in the Longleaf Pine; the proportion that was improved by mowing amounted to 16 percent and 26 percent in the Brown Loam and Longleaf Pine, respectively.

Phosphate, potash, and lime were the minerals commonly used, although basic slag was applied to more acres in the Longleaf Pine than was lime (Appendix Tables 20, 22, 23, 24, and 25). White Dutch clover, lespedeza, red clover, Dallis grass and fescue were the pasture plants most often seeded. Of the total acreage of improved permanent pastures about three-fifths had been fertilized and seeded.[5] The seeding and fertilization rates, where applied, were fairly close to Experiment Station recommendations. Of the total acreage of improved permanent pastures, 59 percent in the Brown Loam and 71 percent in the Longleaf Pine was mowed an average of 1.7 times per acre.

Each producer having improved open permanent pasture was asked to evaluate its carrying capacity in relation to the carrying capacity of unimproved open permanent pasture. The carrying capacity of one acre of improved permanent pasture was estimated to be equal to 2.19 acres of unimproved open permanent pasture in the Brown Loam and to 2.24 acres in the Longleaf Pine.

Temporary winter pasture was provided for the beef enterprise on about two-fifths of the farms in each area and averaged about .8 acre per cow on these farms. Oats alone or in combination with other crops was the predominate type of temporary winter pasture, (Appendix Table 21). When temporary winter pastures were fertilized, nitrogen was the only fertilizer element used in most cases. Nitrogen was applied to 67 percent of the acreage of temporary winter pasture. Each of the other elements were applied to less than 5 percent of the total acres.

On the average, grazing on temporary winter pastures began the first week in December in both areas and continued until the last week in March in the Longleaf Pine and until the second week in April in the Brown Loam. During this period, temporary winter pasture was grazed about 70 percent of the days. On days when grazing was done, the usual grazing period was 24 hours.

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[4] Open permanent pasture where the land had been broken, seeded or fertilized or any combination of these practices was classed as being improved. Open permanent pastures that had been mowed every year for the 4 years immediately preceding the year studied was also classified as being improved.

[5] The seed and fertilizer had not been applied to the same acreage in all cases.

In addition to the grazing, one-fourth of the producers harvested hay or seed from improved permanent pastures or temporary winter pastures or both. An average of nine tons of hay, 14 bushels of oats and 287 pounds of clover seed per farm were harvested from these pastures for all farms studied, (Appendix Tables 31 and 32). White Dutch, red and crimson were the clovers from which seed were harvested. Producers in the Brown Loam harvested more seed and hay from pastures per farm, per acre, and per cow than did producers in the Longleaf Pine.

Overstocking was reported by some producers and understocking by others. Overstocking was reported by 1 percent of the producers in the spring, 5 percent in the summer, 7 percent in the fall and 34 percent in the winter (Appendix Table 34). The average amount of overstocking reported varied from 10 percent in the spring to 30 percent in the winter. Undestocking was reported by 40 percent of the producers in the spring, 28 percent in the summer, 20 percent in the fall, and 7 percent in the winter. The average amount of understocking reported varied from 35 percent in the spring to 30 percent in the winter. There was little difference between areas in the amount of overstocking and understocking reported.

When farmers reporting overstocking were asked what they were doing to offset it, the following answers were received: In the spring 100 percent of the producers reported that they did nothing; in the summer 80 percent reported that they did nothing and 20 percent reported the improvement of permanent pastures; in the fall, 43 percent reported that they did nothing, 43 percent reported feeding and 14 percent reported the use of temporary pastures; in the winter 17 percent reported that they did nothing, 69 percent reported feeding, 11 percent reported the use of temporary pastures and 3 percent reported that cattle were allowed to run loose (Appendix Table 35).

When farmers reporting understocking were asked what they were doing to overcome understocking, the following answers were received: In the spring 67 percent reported that they did nothing. 7 percent reported cutting hay and 26 percent reported increasing livestock numbers; in the summer 55 percent reported that they did nothing, 10 percent reported cutting hay and 35 percent reported increasing livestock numbers; in the fall 71 percent reported that they did nothing and 29 percent reported increasing livestock numbers; and in the winter 47 percent reported that they did nothing and 43 percent reported increasing livestock numbers.

Water for the beef enterprise was supplied from several different sources. Ponds were used by the beef enterprise on 73 percent of the farms studied, creeks on 46 percent and wells on 23 percent (Appendix Table 36). Sixty-one percent of the producers used one source of water,[6] 36 percent used two sources and 3 percent used three sources.

Feeding: During the year studied, most of the feeding was done in December, January, February, and March. For farms studied, roughage per cow averaged 1,243 pounds and concentrates 400 pounds[7] (Appendix Table 37). Producers in each area fed about the same amount of roughage per cow; but, producers in the Longleaf Pine fed considerably more concentrate per cow, 691 pounds compared to 331 pounds in the Brown Loam. Almost 80 percent of the concentrates fed was corn; most of the balance was protein supplement. Of the roughage fed about

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[6] A producer having only one source of water may have had more than one pond, more than one creek or more than one well.

[7] Includes feed fed to other classes of beef animals and was obtained by dividing the total quantities of each type of feed fed the beef enterprise by the average number of cows.

71 percent was hay, 13 percent cottonseed hulls, 8 percent silage (converted to hay equivalent) and 8 percent other roughage (mostly corn shucks and cobs).

There was considerable variation in the feeding program on individual farms. Of the 104 producers interviewed, 48 fed roughage, protein supplement and corn, 31 fed roughage and corn, 15 fed roughage and protein supplement, 8 fed roughage alone, 1 fed corn alone and 1 reported that no feed was given beef cattle. The amount of roughage and concentrates used by the beef enterprise varied from less than 500 pounds per cow on some farms to more than 2 tons per cow on others.

Labor Utilization: Labor used per cow varied from 17.9 hours per cow in the Brown Loam to 28.7 in the Longleaf Pine and averaged 20 hours per cow for all farms (Appendix Table 9). Labor requirements were lowest in the Brown Loam because of the larger herds. Monthly labor requirements per cow varied from 2.7 hours in January and 2.6 hours in February when feeding was heaviest to 1.2 hours in June, July, August and September when the only labor required was for routine checking.

Breeding: Most of the farms studied used purebred beef bulls and grade beef cows. Of the 102 producers having bulls, 98 reported purebred bulls, 85 of them reported registered bulls. Four producers reported that all or part of their cows were purebred. The brood cows averaged 63 percent beef blood on all farms. About five-eights of the cows and three-fourths of the bulls were classified as Hereford; the balance were Shorthorn, Angus, Devon, Red Polled, Brahman, and mixtures or crosses. There was one bull two years old or older for each 31 cows and heifers two years old or older.

On most farms the bull was pastured with the cows and the natural breeding pattern (spring calving) followed. For all farms studied, about three-fourths of the calves were dropped from January through May (Appendix Table 14). Of the two areas, calves were dropped earlier in the Longleaf Pine. Almost one-third of the calves were dropped in January and February in the Longleaf Pine compared to about one-sixth in the Brown Loam. The percentage calf crop calculated from the average number of cows and heifers over two years of age and the number of live calves born was 69 in the Brown Loam, 73 in the Longleaf Pine and averaged 70 for all farms.

Buying and Selling: The production of beef for a particular year includes calves raised and sold, calves raised and kept for replacement, weight put on animals purchased, and weight put on animals on hand at the beginning of the year. Therefore, sales, changes in inventory, purchases and the amount slaughtered for home use must be taken into consideration in determining the amount of beef produced in a given time. During the year studied the production of beef per farm amounted to 16,135 pounds in the Brown Loam, 7,548 pounds in the Longleaf Pine and averaged 13,244 pounds for all farms (Appendix Table 18). Total production of beef per cow averaged 305 pounds in the Brown Loam and 306 pounds in the Longleaf Pine.

In terms of liveweight, 87 percent of the beef produced during the year studied was sold. Of that part, calves accounted for 57 percent, cows 23 percent, steers 15 percent and bulls together with heifers 5 percent.

About two-thirds of the calves were sold at six, seven, or eight months of age; 10 percent were less than six months old, and 24 percent were nine months old or older (Appendix Table 13). The weight at which calves were sold averaged about 380 pounds in each area. Some calves were sold each month of the year; however, the periods of greatest concentration were March-June in the spring and September-November in the fall (Appendix Table 11). Forty-two percent of the calves were sold in the four-month period, March-June, and 46 percent in the three-month period. September-November.

Cows sold during the year amounted to about 9 percent of the number on hand at the beginning of the year. Almost one-half of the cows sold were classified as old cows (10 years or older); about one-sixth of those sold were under six years of age. Cows were marketed each month of the year with January, September, October, November, May and June being the months in which sales were heaviest. About 70 percent of the cows sold were marketed in these six months.

During the year studied, eight calves were purchased for every 100 born. About one-half of these purchases were concentrated in January, February, and March; the balance was scattered with some purchases being made each month (Appendix Table 12). Cows purchased during the year amounted to about 7 percent of the number on hand at the beginning of the year. Purchases of cows were concentrated in October, November, and December with more than three-fourths of the purchases being made in these three months.

Health: Of the 104 farms studied, 37 percent treated for grubs, 37 percent treated for internal parasites, 63 percent sprayed for flies, 79 percent vaccinated for blackleg, 18 percent vaccinated for septicemia, 27 percent vaccinated for bangs and 1 percent tested for T.B. (Appendix Table 15). There was little difference between areas in the level of health and sanitation practices carried out.

Abortion was reported more often in the Longleaf Pine than in the Brown Loam. Producers in the Longleaf Pine reported that 2 percent of their cows aborted compared to 1.1 percent in the Brown Loam and 1.3 percent for all farms.

Death losses for cows averaged 3.4 percent for all farms studied and varied from 3.5 percent in the Brown Loam to 2.9 percent in the Longleaf Pine (Appendix Table 16). Of cows dying, 21 percent was lost from complications at calving, 21 percent from exposure to weather and lack of feed, 15 percent from age, 13 percent from accidents, 10 percent from parasites and diseases, 3 percent from bloat, and 17 percent from unknown causes (Appendix Table 17). Death losses for calves averaged 4.3 percent in the Brown Loam, 4.9 percent in the Longleaf Pine and 4.4 percent for all farms. Of the calves dying, producers reported that 28 percent was lost from exposure to bad weather, 22 percent from complications at birth, 14 percent from parasites and diseases, 10 percent from accidents, 3 percent from scours, 1 percent from bloat and 22 percent from unknown causes. Known causes of death of cows and calves due to parasites and diseases were relatively small in number; perhaps parasites and disease were responsible for some deaths the cause of which was listed as unknown.

Investment, Costs, and Returns

Investment: Investment in the beef enterprises included that in the breeding herd, pasture land (including fences) and buildings. Investment in these three items averaged $19,642 per farm for all farms studied and varied from $23,693 in the Brown Loam to $11,655 in the Longleaf Pine (Table 1). Investment per cow averaged $448 in the Brown Loam, $472 in the Longleaf Pine and $453 on all farms. Investment per cow was higher in the Longleaf Pine because of a greater investment in pasture land and in buildings.

Investment in the breeding herd amounted to 46 percent of total investment in the Brown Loam, 43 percent in the Longleaf Pine and averaged 45 percent for all farms. Investment in breeding stock averaged $205 per cow in each of the two areas. The average value of cows was $172 in the Brown Loam and $162 in the Longleaf Pine. Investment in breeding stock other than cows and heifers two years old and over averaged $33 per cow in the Brown Loam and $43 per cow in the Longleaf Pine.

Pasture land accounted for approximately one-half of the investment in the beef enterprise in each of the areas studied. Investment in pasture land per cow was $227 in the Brown Loam, $239 in the Longleaf Pine, and an average of $230 for all farms. Producers in the Longleaf Pine had the highest investment per cow in pasture because they had a greater acreage of improved permanent pasture and temporary winter pasture per cow. On the average, improved permanent pastures accounted for 48 percent of the investment in pasture land, unimproved permanent pastures 29 percent, woodland pastures 17 percent and temporary winter pastures 17 percent.

Buildings used by the beef enterprises accounted for only 4 percent of the investment in the beef enterprise in the Brown Loam and 6 percent in the Longleaf Pine. Investment in buildings per cow averaged $16 in the Brown Loam, $28 in the Longleaf Pine and $18 for all farms. Larger herds probably accounted for the lower investment in buildings per cow in the Brown Loam. The general barn accounted for the larger part of the investment in buildings, an average of 76 percent.

Costs: Total cost, excluding a charge for interest on investment, amounted to $2,854 per farm in the Brown Loam, $2,027 in the Longleaf Pine and averaged $2,575 for all farms (Table 2). Although total cost per farm was lowest in the Longleaf Pine, total cost per cow was highest, $82.07 compared to $53.95 in the

Table 1. Investment in beef enterprise per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951

Item	Soil area			Soil area		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
Breeding herd:						
	Dollars per farm			Dollars per cow		
Cows, 2+	9,088	4,000	7,375	172	162	170
Heifers, 1-2	980	626	862	19	25	20
Bulls, 2+	686	382	584	13	16	13
Bulls, 1-2	78	56	70	1	2	2
Total	10,832	5,064	8,891	205	205	205
Pasture land:						
Improved permanent	5,371	3,654	4,793	102	148	111
Unimproved permanent	3,840	925	2,859	73	38	66
Temporary winter	631	420	560	12	17	13
Temporary summer	17	8	14	*	*	*
Woodland	2,138	900	1,722	40	36	40
Total	11,997	5,907	9,948	227	239	230
Buildings:						
General barn	641	562	614	12	23	14
Hay barn	142	100	128	3	4	3
Other buildings	81	22	61	1	1	1
Total	864	684	803	16	28	18
Total investment	23,693	11,655	19,642	448	472	453

*Less than $0.50 per cow.

Table 2. Total cost per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil areas: Brown Loam	Soil areas: Longleaf Pine	Average	Soil areas: Brown Loam	Soil areas: Longleaf Pine	Average
	Dollars per farm			Dollars per cow		
Pastures[1]	851	743	814	16.09	30.08	18.78
Feed[2]	1,076	693	948	20.34	28.06	21.87
Buildings[3]	127	88	114	2.40	3.56	2.63
Labor[4]	375	284	344	7.09	11.50	7.94
Marketing[5]	135	59	109	2.55	2.39	2.51
Miscellaneous[6]	290	160	246	5.48	6.48	5.67
Total	2,854	2,027	2,575	53.95	82.07	59.40

[1] See Appendix Table 31 for details.
[2] See Appendix Table 37 for details.
[3] See Appendix Table 6 for details.
[4] See Appendix Table 9 for details.
[5] See Appendix Table 38 for details
[6] See Appendix Table 39 for details.

Brown Loam. Producers in the Longleaf Pine not only had higher total cost per cow, but each item of cost was higher with the exception of marketing cost. Total cost per cow averaged $59.40 for all farms.

The annual cost of pastures accounted for about one-third of the total cost of the enterprise. Pasture costs per cow were almost twice as high in the Longleaf Pine as in the Brown Loam, $30.08 compared to $16.09; the cost per cow for all farms averaged $18.78. A larger acreage of improved permanent pastures which had a higher annual cost per acre was the primary factor responsible for the higher pasture cost per cow in the Longleaf Pine. For the farms as a group, improved permanent pastures accounted for 64 percent of total pasture costs; temporary winter pastures accounted for another 26 percent.

The market value of home-grown feed and the cost of purchased feed fed to the beef enterprise averaged $21.87 per cow which was slightly more than one-third of the total cost of the enterprise. Feed cost per cow was highest in the Longleaf Pine, $28.06 compared to $20.34 in the Brown Loam. The higher feed cost per cow in the Longleaf Pine resulted from the feeding of more concentrates, almost twice as much as in the Brown Loam.

The annual cost of buildings per cow averaged $2.40 in the Brown Loam, $3.56 in the Longleaf Pine and $2.63 for all farms. This amounted to about 4 percent of the total cost of the enterprise in each area.

At least a part of the labor used in taking care of the beef enterprise on many farms was hired; therefore, all labor used was included as an item of cost. On those farms where the operator and his family took care of the enterprise, a more realistic picture of the cost involved may be obtained by deducting labor cost from total cost. Labor cost accounted for an average of 13 percent of the total cost of the enterprise. Labor cost per cow averaged $7.09 in the Brown Loam, $11.50 in the Longleaf Pine and $7.94 for all farms. Larger herds probably accounted for the lower labor cost per cow in the Brown Loam.

The cost of marketing beef animals, including such items as hauling, commission fees and yardage, averaged $2.51 per cow or 4 percent of the total cost of the enterprise. There was little difference in marketing cost per cow between the two areas. Commission fees constituted the greatest part of marketing costs.

Miscellaneous items such as veterinary fees and medicine, sprays and disinfectants, feed grinding, salt, etc., used in connection with the beef enterprise amounted to an average of $5.67 per cow or 10 percent of total costs. Miscellaneous costs per cow were slightly higher in the Longleaf Pine than in the Brown Loam, $6.48 compared to $5.48.

Returns: Total returns amounted to $5,233 per farm in the Brown Loam, $2,122 in the Longleaf Pine and averaged $4,187 for all farms (Table 3). Total returns per cow were also highest in the Brown Loam, $98.92 compared to $85.91 in the Longleaf Pine; the average for all farms was $96.59. Higher returns per cow in the Brown Loam than in the Longleaf Pine was a result of selling beef animals for higher prices per pound and of taking more hay and seed (pasture credits) off the pasture land utilized by the beef enterprise. On the average the production of beef accounted for 92 percent of total returns and pasture credits the balance.

The difference between total returns and total cost as calculated here is called return to investment and represents the return to the operator for capital invested in the enterprise and for management of the enterprise. Return to investment per farm amounted to $2,379 in the Brown Loam, $95 in the Longleaf Pine and averaged $1,612 for all farms.

Producers in the Brown Loam had returns to investment per cow several times that of producers in the Longleaf Pine, $44.97 compared to $3.84; return to investment per cow averaged $37.19. The percentage returns on capital invested was 10 percent in the Brown Loam, .8 percent in the Longleaf Pine and 8.2 percent for all farms.

Comparison of High-Profit and Low-Profit Herds

The most profitable herds and least profitable herds in each area were compared to determine the characteristics of each group. In each area approximately 30 percent of the farms studied were included in the most profitable group and about 30 percent in the least profitable group.

The most profitable herds in the Brown Loam had a return to investment per cow of $68 compared to minus $9 for the least profitable herds; comparable figures in the Longleaf Pine were $41 for the most profitable herds and minus $43 for the least profitable herds (Table 4). For the most profitable herds the rate of return to capital invested averaged 16 percent in the Brown Loam and 7 percent in the Longleaf Pine.

In the Brown Loam it was found that the most profitable herds had the following characteristics as compared to the least profitable herds: higher returns, lower costs, and less capital invested per cow; larger herds, more experienced operators; better quality cows and bulls; a smaller acreage of pasture per cow and more hay and seed saved from pasture; less roughage and concentrates fed per cow; a high-

Table 3. Total return and returns to investment per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil areas			Soil areas		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
	Dollars per farm			Dollars per cow		
Value of beef produced[1]	4,780	2,029	3,855	90.36	82.15	88.93
Pasture credits[2]	453	93	332	8.56	3.76	7.66
Total returns	5,233	2,122	4,187	98.92	85.91	96.59
Less total cost	2,854	2,027	2,575	53.95	82.07	59.40
Return to investment	2,379	95	1,612	44.97	3.84	37.19
Percent return to investment	10.0	.8	8.2			

[1] See Appendix Table 18 for details.

[2] See Appendix Tables 32 and 33 for details.

Table 4. Comparison of returns, cost, and returns to investment per cow on the most profitable and least profitable farms, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Brown Loam		Longleaf Pine	
	20 most profitable farms	20 least profitable farms	10 most profitable farms	10 least profitable farms
Returns:		Dollars per cow		
Value of beef produced	103	53	106	87
Pasture credits	5	2	6	1
Total returns	108	55	112	88
Costs:				
Feed	13	29	19	52
Pasture	11	13	31	41
Labor	7	10	9	18
Buildings	2	3	3	5
Marketing	2	2	3	4
Miscellaneous	5	7	6	11
Total costs	40	64	71	131
Return to investment	68	—9	41	—43
Percent return to investment	16	—2	7	—9

er percent calf crop; lower death losses for cows and calves; more calves dropped early in the year; calves sold at heavier weights; more beef produced per cow; and less labor used per cow (Appendix Table 49).

The difference between the most profitable herds and the least profitable herds in the Longleaf Pine were found to be quite similar to those found in the Brown Loam; however, there were a few exceptions. The least profitable herds had less capital invested per cow, a few more calves dropped early in the year, a higher percent calf crop, lower death losses for calves and slightly more beef produced per cow. The earlier calving, the higher percent calf crop, the lower death losses for calves and the higher production of beef per cow on the least profitable farms was probably the result of the expensive (and unprofitable) feeding and grazing program carried on.[8]

A comparison of the most profitable herds with the average of all herds in the same area showed that the operators of the most profitable herds did a little better job in practically all phases of management. They appeared to have a fairly well balanced management program that did not emphasize, or neglect, one practice in relation to other practices. On the other hand, the operators of the least profitable herds not only did a poorer job than the average for all farms in practically all phases of management, but they also neglected, or overemphasized, one or more management practices in relation to other practices. For example, in the Brown Loam the very high death rate for both cows and calves, which no doubt was the result of improper care of animals and inadequate health and sanitation practices, was the most important factor contributing to the lack of profits on the least profitable farms. Also, in the Longleaf Pine an expensive feeding and grazing program, although resulting in slightly more beef produced per cow, was the major factor contributing to the large losses on the least profitable farms.

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[8] These producers carried their cows through the winter in heavier flesh than necessary. Feeding tests have shown that cows going into the winter in good flesh can lose as much as 50 to 125 pounds in weight and still produce normal calves (Morrison's Feeds and Feeding). Cows coming out of the winter in thrifty condition can regain lost weight rapidly on lush spring grazing.

Varying Prices Related to Profits

The relatively high return to investment of $37 per cow for all farms studied was due in part to the favorable cost-price relationship that existed during the year studied. For example, prices received for beef animals by Mississippi producers during the year studied was 159 percent of the 1945-49 average, 287 percent of the 1940-44 average, 517 percent of the 1935-39 average, and 259 percent of the 1935-49 average. On the other hand, prices paid by Mississippi farmers during the year studied were only 121 percent of the 1945-49 average, 177 percent of the 1940-44 average, 211 percent of the 1935-39 average, and 161 percent of the 1935-49 average (Appendix Table 45).

If prices received and paid during the year studied had been equal to those received and paid during the periods specified above, returns to investment per cow for all farms would have been as follows: $10.38 based on 1945-49 prices; $1.05 based on 1940-44 prices; minus $6.83 based on 1935-39 prices; and $1.54 based on 1935-49 prices (Appendix Table 48). Producers in the Longleaf Pine would have operated at a loss for each of the three five-year price periods and would have had a negative return to investment of $18.89 per cow for the 15-year price period. Producers in the Brown Loam would have operated at a profit with 1945-49 and 1940-44 prices, at a loss with 1935-39 prices and would have had a return to investment per cow of $6.35 for the 15-year price period, 1935-49. The rate of return to capital invested based on the 15-year price period would have averaged 3 percent in the Brown Loam, minus 8 percent in the Longleaf Pine and 1 percent for all farms.

In contrast to the unfavorable return to investment for the average producer when cost and returns were calculated on the basis of prices prevailing from 1935 through 1949, the most profitable herds in the Brown Loam would have operated at a profit in each of the three five-year periods and would have had a return to investment of $17 per cow for the 15-year price period; the rate of return to capital invested would have averaged 8 percent for the 15-year price period and would have varied from 3 percent for the 1935-39 price period to 11 percent for the 1945-49 price period (Appendix Table 50). The fact that the most successful producers would make profits even under what is generally considered to be unfavorable cost-price relationships points up the importance of keeping costs low because of the failure of the cost of items used in production to fall proportionally when there is a decline in prices received for agricultural products.

It should be pointed out at this time that, even under conditions where returns to investment in the beef enterprise are low, it does not necessarily follow that the producer should shift to some other enterprise because the beef enterprise may be returning more to all of the factors used than would alternative enterprises. For example, even if returns to investment were zero, the operator would still be receiving full pay for all of the other factors of production used including his own labor valued at the prevailing wage and home-grown feed valued at market price.

SUMMARY AND CONCLUSIONS

Returns to investment per cow were higher in the Brown Loam than in the Longleaf Pine because of higher returns and lower costs. Returns per cow were higher in the Brown Loam because producers sold animals for higher prices per hundredweight and saved more hay and seed from pasture land. The higher prices received in the Brown Loam can largely be attributed to better quality cows and bulls.

Costs per cow were lower in the Brown Loam than in the Longleaf Pine because producers (1) used fewer acres of pasture per cow which also had a lower annual cost per acre; (2) fed approximately the same amount of roughage per cow, but about one-half as much concentrates; (3) used less labor per cow; and (4) had lower building and miscellaneous cost per cow. Larger herds in the Brown Loam was the major factor accounting for lower labor requirements and lower building costs per cow.

A comparison of the most profitable herds with the average of all herds in the same area showed that the operators of the most profitable herds did a little better job in practically all phases of management. They appeared to have a fairly well balanced management program that did not emphasize, or neglect, one practice in relation to other practices. On the other hand, the operators of the least profitable herds not only did a poorer job than the average for all farms in practically all phases of management, they also neglected, or overemphasized, one or more management practice in relation to other practices. For example, the emphasis placed on keeping brood cows looking good during the winter months, which is not necessary to produce a normal calf, was the management practice that contributed most to the lack of profits on many farms.

The relatively high return to investment per cow for all farms studied was due in part to the favorable cost-price relationship that existed during the year studied. If prices received and paid during the year studied had been equal to those received and paid from 1935 through 1949, from 1945 through 1949, from 1940 through 1944, and from 1935 through 1939, the average return to investment per cow would have been very low for the 15-year price period and at a negative level for the 1935-39 price period. In contrast, the most profitable herds in the Brown Loam would have operated at a profit in each of the three five-year price periods and would have averaged a favorable rate of return for the 15-year price period.

The results of this study showed that profitable beef production is based upon a well-balanced management program that does not overemphasize or neglect one practice in relation to other practices. The operators of the least profitable farms should give special attention to (1) keeping feed cost low by reducing the quantities of hand-fed feed and utilizing the less expensive feeds whenever possible and yet bringing brood cows out of the winter in thrifty condition; (2) keeping grazing costs low by stocking pasture at correct rate, by saving hay or seed or both from pastures whenever sufficient surplus grazing exists and by limited use of expensive pastures for brood cows; (3) improving the quality of animals by using better bulls and selecting with more care replacement heifers and cows; and (4) reducing death losses by using better health and sanitation practices and by giving animals better care during critical periods. No doubt, all producers can increase profits to some extent by making improvements in one or more of the above and other practices to bring them into better balance with each other.

APPENDIX I

Methods Used In Calculating Investments, Costs, And Returns

A. Investment.

1. **Beef Herd.** The average number of each class of beef animals was calculated from the number on hand at the beginning and at the end of the year. Investment in the beef herd was determined from the average number of each class of beef animals and producer estimates of the value of each class at the end of the year. An allowance was made on each farm for changes in weight of each class of animal.

2. **Land.** Acreage of pasture land used by the beef herd was calculated by prorating the total acreage, on the basis of grazing secured, between the beef herd and other livestock. Investment in pasture land was based on the number of acres used by the beef herd and producer estimates of value per acre, which include the value of fences. Only one-half of the value of land double-cropped was included in the investment. Woodland pasture was valued for grazing purposes only.

3. **Buildings.** It was assumed that the average investment in buildings would approximate one-half of the replacement cost. Investment in buildings was based on this assumption and on producer estimates of replacement cost. Investment in buildings used jointly with other livestock was prorated on the basis of the proportion used by the beef herd.

B. Costs.

1. **Feed.** Feed costs were based on producer estimates of quantities fed and the average price of each kind of feed. The price used for home-grown feeds was the price paid farmers during the harvest season.

2. **Pasture.** Pasture cost was based on the acreage used by the beef enterprise and the annual cost per acre of each type of pasture. In calculating pasture costs, labor cost was calculated at the prevailing wage rate of 40 cents per hour; machinery cost was based on farm management cost studies; fencing cost was based on producer estimates as to the materials, labor, and equipment used and prevailing prices; and seed and fertilizer costs were calculated by using average prices for the year studied and producer information as to quantities used.

In calculating the total cost of improved permanent pasture, the total cost of improvements made was calculated on the basis of July 1950-June 1951 prices regardless of the year in which the improvement was made. Because of wide differences in P. M. A. payment rates in different years and in the different counties, no deduction from total pasture cost for these payments was made.

Upon the recommendation of agronomists, the annual charges for seed, fertilizer and land preparation for improved permanent pasture were calculated as follows: (1) seed, one-tenth of the total cost; (2) land preparation except for applying fertilizer, one-tenth of the total cost; and (3) cost of fertilizer, including application, was calculated as follows: the total cost of nitrogen was charged to the year applied; 40 percent of the total cost of phosphate, potash and basic slag was charged to the year applied, 40 percent to the following year and 20 percent to the third year; and 20 percent of the total cost of lime was charged to each of the first four years after its application, 10 percent to the fifth year and 10 percent to the sixth year. In addition, the annual cost of improved permanent pasture included mowing and fencing.

3. **Buildings.** Building cost included depreciation and repairs. The annual charge for depreciation was calculated by the straight-line method; charges for repairs were based on farm management cost studies and were calculated at 3 percent of replacement cost.

4. **Labor.** Labor cost was based on producer estimates of time spent on the beef herd and the prevailing wage rate (40 cents per hour).

5. **Marketing.** Marketing cost was based on producer information as to commission fees and other marketing costs.

6. **Miscellaneous.** Miscellaneous cost was based on producer information as to these costs or as to the quantities of miscellaneous items used and the average price of these items.

C. Receipts.

1. **Beef Production.** Receipts from the production of beef were calculated by adding the value of animals sold and animals killed for food and inventory changes and subtracting the value of animals purchased. In calculating the value of inventory changes, increases or decreases in inventory were valued at prices per pound prevailing at the end of the year.

2. **Pasture Credits.** Pasture credits were based on producer estimates as to the quantity of hay and seeds harvested from pasture land charged to the beef enterprise and prevailing prices for these items. The average price received for these items was discounted by amount equal to the cost of harvesting.

APPENDIX II

Table 1. Land use, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil Area		Average
	Brown Loam	Longleaf Pine	
	Acres per farm		
Cropland	141	41	107
Permanent pasture	202	96	166
Woodland pasture	254	101	203
Woodland	89	25	67
Other	18	2	13
Total operated	704	265	556

Table 2. Cropping pattern, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil Area		Average
	Brown Loam	Longleaf Pine	
	Acres per farm		
Cotton	44	6	31
Corn	58	18	45
Hay	15	12	14
Seed corn	15	1	10
Temporary winter pasture[1]	3	4	3
Other	4	3	3
Idle	5	1	4
Total[2]	144	45	110

[1] On cropland. Does not include temporary winter pasture on permant pasture.

[2] The totals are larger than the acres of cropland because of double cropping.

Table 3. Power and equipment used, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil Area		Average
	Brown Loam	Longleaf Pine	
	Percentage of farms having		
Tractor	72	89	78
Cultipacker	16	17	16
Grain drill	29	0	19
Lime spreader	30	37	33
Mower	70	69	69
Rake	45	26	39
Baler	12	3	9
Combine	22	6	16
Silage cutter	6	3	5

Table 4. Buildings used in connection with the beef enterprise, 104 beef cattle farms, South, Mississippi, Julyy 1950-June 1951.

Item	Soil Area		Average
	Brown Loam	Longleaf Pine	
	Percentage of farms having		
General barn	81	77	80
Hay barn	12	9	10
Temporary shelter	4	0	3
Other	13	3	10

Table 5. Total replacement cost of buildings per farm and replacement cost to the beef enterprise per farm, 104 beef cattle farms, South Mississippi ,July 1950-June 1951.

Item	Soil area		Average	Soil area		Average
	Brown Loam	Longleaf Pine		Brown Loam	Longleaf Pine	
	Total replacement cost (dol.)			Replacement cost to beef (dol.)		
General barn	1,565	1,330	1,486	1,282	1,125	1,229
Hay barn	287	199	257	283	199	255
Temporary shelter	46	----	31	45	----	30
Other	143	43	110	117	43	92
Total	2,041	1,572	1,884	1,727	1,367	1,606

Table 6. Building cost per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average	Soil area		Average
	Brown Loam	Longleaf Pine		Brown Loam	Longleaf Pine	
	Dollars per farm			Dollars per cow		
Depreciation	75.18	46.91	65.66	1.42	1.90	1.53
Repair	51.87	40.99	48.20	.98	1.66	1.11
Total	127.05	87.90	113.86	2.40	3.56	2.64

Table 7. Age and sex distribution of family labor force, per farm, 104 beef cattle farms, South Mississippi, July 1950-June 1951

Item	Age group						
	Under 9	9-12	13-17	18-59	60-69	70 and above	Total
Brown Loam:							
Males	.16	.07	.13	.80	.31	.07	1.54
Females	.13	.06	.14	.87	.19	.07	1.46
Total	.29	.13	.27	1.67	.50	.14	3.00
Longleaf Pine:							
Male	.09	.09	.20	.86	.11	----	1.35
Females	.26	.06	.09	.86	.11	.09	1.47
Total	.35	.15	.29	1.72	.22	.09	2.82
Average:							
Males	.13	.08	.15	.82	.25	.04	1.47
Females	.17	.06	.12	.87	.16	.08	1.46
Total	.30	.14	.27	1.69	.41	.12	2.93

Table 8. Age of operators, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Age	Soil area		Average
	Brown Loam	Longleaf Pine	
	Percent		
20 - 29	6	6	6
30 - 39	6	19	10
40 - 49	23	30	26
50 - 59	28	30	28
60 - 69	30	15	25
70 and above	7	----	5
Total	100	100	100

Table 9. Hours of labor used per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Per farm:													
Brown Loam	126	123	104	63	63	57	59	57	56	58	72	100	938
Longleaf Pine	95	86	75	42	43	42	43	42	42	52	63	86	711
Average	115	111	94	56	56	52	54	52	51	56	69	95	861
Per cow:													
Brown Loam	2.4	2.3	2.0	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.4	1.9	17.9
Longleaf Pine	3.8	3.5	3.0	1.7	1.7	1.7	1.7	1.7	1.7	2.1	2.6	3.5	28.7
Average	2.7	2.6	2.2	1.3	1.3	1.2	1.2	1.2	1.2	1.3	1.6	2.2	20.0

Table 10. Beef cattle numbers, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	On hand July 1, 1950	Born	Purchased	Home use	Sold	Died	On hand June 30, 1951
Brown Loam:							
Cows, 2+	50.4	----	4.1	----	4.3	1.9	55.4
Heifers, 1-2	6.9	----	.8	----	.2	.4	8.2
Bulls, 2+	1.6	----	.2	----	.2	*[1]	1.6
Bulls, 1-2	.1	----	.2	----	.2	*[1]	.7
Steers, 1+	1.0	----	1.1	----	3.0	*[1]	1.2
Calves, 1-	2.8	36.5	2.8	.2	21.8	1.6	32.7
Total	88.0	36.5	9.2	.2	29.7	4.0	99.8
Longleaf Pine:							
Cows, 2+	24.2	----	1.0	----	2.4	.7	25.2
Heifers, 1-2	3.4	----	.1	----	.3	.1	5.7
Bulls, 2+	1.0	----	*[1]	----	.2	----	1.0
Bulls, 1-2	.3	----	.1	----	.1	----	.2
Steers, 1+	.4	----	.1	----	.8	----	1.1
Calves, 1—	13.8	18.1	1.3	.1	8.3	.9	16.7
Total	43.1	18.1	2.6	.1	12.1	1.7	49.9
Average:							
Cows, 2+	41.5	----	3.1	----	3.7	1.5	45.2
Heifers, 1-2	5.7	----	.6	----	.2	.3	7.3
Bulls, 2+	1.4	----	.1	----	.2	*[1]	1.4
Bulls, 1-2	.2	----	.1	----	.2	*[1]	.5
Steers, 1+	.8	----	.7	----	2.3	*[1]	1.1
Calves, 1—	23.2	30.3	2.3	.2	17.2	1.4	27.3
Total	43.1	18.1	2.6	.1	12.1	1.7	49.9

[1] Less than .05.

Table 11. Percentage of specified animals sold by months, 104 beef cattle farms, South Mississippi, July 1950-June 1951

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Cows:													
Brown Loam	5.3	1.2	13.4	5.7	13.2	10.8	3.6	6.9	12.4	11.8	11.4	4.3	100.0
Longleaf Pine	10.0	5.2	5.9	7.0	15.9	9.2	3.3	4.8	16.6	12.5	6.3	3.3	100.0
Average	20.1	5.0	6.6	7.3	8.6	9.6	1.6	5.6	10.6	10.2	9.2	5.6	100.0
Calves:													
Brown Loam	5.3	1.2	13.4	5.7	13.7	10.8	3.6	6.9	12.4	11.8	11.4	4.3	100.0
Longleaf Pine	10.0	5.2	5.7	7.0	15.9	9.2	3.3	4.8	16.6	12.5	6.3	3.3	100.0
Average	6.0	1.8	12.2	5.9	13.6	10.5	3.6	6.6	13.1	11.9	10.6	4.2	100.0

Table 12. Percentage of animals purchased by months, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Cows:													
Brown Loam	6.0	3.0	.4	.4	.4	.4	.4	.4	3.9	32.9	33.8	18.0	100.0
Longleaf Pine	----	10.4	17.2	3.4	10.4	13.8	6.9	----	6.9	13.8	17.2	----	100.0
Average	5.3	3.8	2.3	.8	1.5	1.9	1.1	.4	4.2	30.8	31.9	16.0	100.0
Calves:													
Brown Loam	20.9	17.4	17.4	4.7	5.4	5.4	6.7	4.0	4.7	4.0	5.4	4.0	100.0
Longleaf Pine	----	19.6	13.0	6.5	13.1	8.7	----	----	6.5	17.4	4.3	10.9	100.0
Average	15.9	18.0	16.4	5.1	7.2	6.2	5.1	3.1	5.1	7.2	5.1	5.6	100.0

Table 13. Ages at which cows and calves were sold, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
		Percent	
Age of cows sold (years):			
Under 6	11.5	37.1	16.7
6 - 7	16.4	17.8	16.7
8 - 9	18.8	16.1	18.3
10 and above	53.3	29.0	48.3
Total	100.0	100.0	100.0
Age of calves sold (months):			
Below 6	10.2	7.9	9.8
6 - 8	64.5	77.7	66.6
9 and above	25.3	14.4	23.6
Total	100.0	100.0	100.0

Table 14. Percentage of calves born during each month and percent calf crop, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Month	Soil area		Average
	Brown Loam	Longleaf Pine	
		Percent	
January	6.0	14.4	7.7
February	8.7	17.4	10.5
March	19.6	23.6	20.4
April	22.7	16.3	21.4
May	16.7	8.3	15.0
June	9.5	3.5	8.2
July	3.8	3.5	3.8
August	2.4	2.2	2.4
September	2.8	2.7	2.8
October	2.0	2.5	2.1
November	1.9	2.5	2.0
December	3.9	3.1	3.7
Total	100.0	100.0	100.0
Percent calf crop	69	73	70

Table 15. Health practices, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
	Percent of producers		
Treating for grubs	33	43	37
Treating for internal parasites	38	29	35
Spraying for flies	61	69	63[1]
Vaccinating for:			
Blackleg	83	71	79
Septicemia	20	14	18
Bangs	20	40	27
Testing for T.B.	1	----	1

[1] An average of 5 times during the year.

Table 16. Death losses and abortion, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
	Percent		
Death losses:[1]			
Cows, 2+	3.5	2.9	3.4
Heifers, 1-2	5.6	1.3	4.6
Bulls, 2+	2.7	----	2.0
Bulls, 1-2	11.5	----	8.6
Steers, 1+	2.7	----	2.0
Calves, 1—	4.3	4.9	4.4
Abortion[2]	1.1	2.0	1.3

[1] Given as a percentage of the average number of each class of animals, except calves. Death losses for calves was calculated by dividing the number of calves dying by the number of calves born.

[2] Given as a percentage of the average number of cows.

Table 17. Cause of death, cows and calves, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average	Soil area		Average
	Brown Loam	Longleaf Pine		Brown Loam	Longleaf Pine	
	Percent of cows			Percent of calves		
Calving	20	26	21	16[2]	42[2]	22[2]
Weather and feed deficiency	24	7	21	36[3]	----	28[3]
Age	16	----	15	----	----	----
Accidents	14	----	13	4	29	10
Parasites and diseases	10[1]	7[1]	10[1]	15[4]	13[4]	14[4]
Bloat	4	----	3	1	----	1
Scours	----	----	----	4	----	3
Unknown	12	60	17	24	16	22
Total	100	100	100	100	100	100

[1] Septicemia and pnuemonia.

[2] Complications at birth.

[3] Weather only.

[4] Blackleg and septicemia.

Table 18. **Beef production per farm, 104 beef cattle farms, South Mississippi, July 1950-June 1951.**

	Soil area			Soil area		
Item	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
	Liveweight (pounds)			Value (dollars)		
Sales:						
Cows, 2+	3,201	1,680	2,690	704	349	585
Heifers, 1-2	105	142	118	24	34	27
Bulls, 2+	282	277	280	67	67	67
Bulls, 1-2	193	58	148	38	12	29
Steers, 1+	2,286	564	1,706	659	158	490
Calves, 1—	8,316	3,178	6,586	2,509	952	1,985
	14,383	5,899	11,528	4,001	1,572	3,183
Increase in inventory:						
Cows, 2+	3,389	528	2,424	946	145	677
Heifers, 1-2	752	1,275	928	213	304	244
Bulls, 2+	—32	5	—20	6	16	9
Bulls, 1-2	351	—69	210	126	—22	76
Steers, 1+	57	339	152	64	82	70
Calves, 1—	1,440	514	1,128	476	145	365
Total	5,957	2,592	4,822	1,831	670	1,441
Home use:						
Calves	85	33	67	25	12	21
Purchased:						
Cows, 2+	2,587	660	1,939	623	129	456
Heifers, 1-2	357	26	246	78	6	53
Bulls, 2+	157	36	116	67	9	48
Bulls, 1-2	115	50	93	50	21	41
Steers, 1+	489	28	334	98	6	67
Calves, 1—	585	176	445	161	54	125
Total	4,290	976	3,173	1,077	225	790
Net production:[1]						
Cows, 2+	4,003	1,548	3,175	1,027	365	806
Heifers, 1-2	500	1,391	800	159	332	218
Bulls, 2+	93	246	144	6	74	28
Bulls, 1-2	429	—61	265	114	—31	64
Steers, 1+	1,854	875	1,524	625	234	493
Calves, 1—	9,256	3,549	7,336	2,849	1,055	2,246
Total per farm	16,135	7,548	13,244	4,780	2,029	3,855
Total per cow	305	306	306	90.36	82.15	88.93

[1] Sales plus increase in inventory plus home use minus purchases

Table 19. Other livestock production, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Percent of farms having enterprises of commercial importance[1]	Average no. of animals per farm having enterprises of commercial imp.	Average number per farm
Hogs:			
Brown Loam	45	70	32
Longleaf Pine	3	25	2
Average	31	69	22
Sheep:			
Brown Loam	1	14	[2]
Longleaf Pine	0	0	0
Average	1	14	[2]
Dairy cows:			
Brown Loam	0	0	2
Longleaf Pine	0	0	1
Average	0	0	2
Laying hens:			
Brown Loam	0	0	31
Longleaf Pine	3	250	40
Average	1	250	34

[1] Hogs, 10 or more sold; sheep, 10 or more sold; dairy cows, 10 or more milked; and laying flock, 200 or more hens.

[2] Less than .5 head.

Table 21. Land preparation, fertilization and seeding practices, all temporary winter pastures. 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Percentage of total acreage covered			Times over or rates where performed		
	Soil area			Soil area		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Pine Longleaf	Average
Land prparation:						
Discing	36	43	37	2.1	2.8	2.3
Breaking	11	5	9	1.0	1.8	1.1
Harrowing	32	3	24	1.3	2.0	1.4
Cultipacking	17	22	18	1.0	1.0	1.0
Fertilizing	68	62	67	1.0	1.0	1.0
Liming	----	10	3	----	1.0	1.0
Seeding	100	96	99	1.1	1.2	1.1
Mowing	2	----	1	1.0	----	1.0
Fertilization:						
Lime	----	10	3	----	2,000	2,000
Basic slag	----	----	----	----	----	----
Mixed fertilizer	----	3	1	----	400	400
Nitrogen (N)	70	57	67	63	47	59
Phosphate (P_2O_5)	1	5	2	80	59	65
Potash (K_2O)	----	10	3	----	50	50
Seeding:						
Oats	95	64	87	99	112	102
Rye grass	2	47	15	16	16	16
Red clover	29	----	21	11	----	11
Crimson clover	1	10	4	15	20	19
Austrian winter peas	----	7	2	----	18	18
Vetch	----	7	2	----	18	18
Wild winter peas	3	----	2	20	----	20
Wheat	1	----	1	90	----	90

Table 20. Land preparation, fertilization and seeding practices, all improved open permanent pastures, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Percentage of total acreage covered			Times over or rates where performed		
	Soil area			Soil area		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
Land preparation:						
Discing	51	55	52	2.8	2.5	2.7
Breaking	22	16	21	1.1	1.1	1.1
Harrowing	35	47	38	1.6	1.8	1.7
Cultipacking	14	30	18	1.6	1.2	1.4
Fertilizing	58	70	61	1.6	1.8	1.7
Liming	45	34	42	1.0	1.0	1.0
Seeding	61	60	61	1.4	1.5	1.4
Mowing	59	71	62	1.7	1.7	1.7
Fertilization:						
Lime	45	34	42	1,995	2,361	2,073
Basic slag	11	39	18	353	1,182	817
Mixed fertilizer	*[1]	10	3	500	362	367
Nitrogen (N)	15	23	17	45	50	47
Phosphate (P_2O_5)	55	41	51	81	83	81
Potash (K_2O)	30	42	33	64	78	69
Seeding:						
Fescue	11	8	10	12	7	11
Lespedeza (common)	9	10	9	22	21	22
Lespedeza (Kobe)	8	4	7	23	30	24
Lespedeza (Korean)	*[1]	----	*[1]	21	----	21
Red clover	17	4	14	9	11	10
Crimson clover	3	24	8	13	12	12
White Dutch clover	32	33	32	8	6	8
Dallis grass	8	14	10	9	11	10
Ladino clover	3	4	3	2	3	2
Alyce clover	----	3	1	----	20	20
Yellow hop clover	----	3	1	----	1	1
Sericea lespedeza	----	2	*[1]	----	27	27
Rye grass	3	10	5	16	27	22
John grass	*[1]	----	*[1]	20	----	20
Bahia grass	----	2	1	----	18	18

[1] Less than .5 percent.

Table 22. Land preparation, fertilization and seeding practices, open permanent pasture improved by land preparation, fertilization and seeding, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Percentage of total acreage covered			Times over or rates where performed		
	Soil area			Soil area		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
Land preparation:						
Discing	98	100	98	2.6	2.6	2.6
Breaking	50	29	44	1.1	1.1	1.1
Harrowing	79	88	82	1.6	1.8	1.6
Cultipacking	30	57	38	1.6	1.2	1.4
Fertilizing	99	99	99	1.6	1.9	1.7
Liming	69	56	60	1.0	1.0	1.0
Seeding	100	100	100	1.6	1.5	1.6
Mowing	81	65	75	1.8	1.8	1.8
Fertilization:						
Lime	69	56	60	1,928	1,294	2,009
Basic slag	20	45	31	434	2,440	919
Mixed fertilizer	*[1]	19	6	500	371	376
Nitrogen (N)	37	42	38	45	51	47
Phosphate (P_2O_5)	90	55	79	86	84	86
Potash (K_2O)	59	63	60	64	92	70
Seeding:						
Fescue	24	16	22	12	7	11
Lespedeza (common)	14	12	13	22	22	22
White Dutch clover	72	57	67	8	6	8
Rye grass	6	18	10	13	27	21
Red clover	33	7	25	9	11	9
Dallis grass	11	20	14	11	11	11
Crimson clover	8	44	19	13	12	12
Ladino clover	7	7	7	2	3	2
Lespedeza (Kobe)	4	7	5	20	29	24
Lespedeza (Korean)	1	----	1	21	----	21
Johnson grass	1	----	1	20	----	20
Alyce clover	----	6	2	----	20	20
Wild winter peas	----	1	*[1]	----	4	4
Bahia grass	----	4	1	----	18	18
Lespedeza (sericea)	----	3	1	----	28	28
Yellow hop clover	----	6	*[1]	----	1	1

[1] Less than .5 percent.

Table 23. Fertilization and seeding practices, open permanent pasture improved by fertilization and seeding, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Percentage of total acreage covered			Times over or rates where performed		
	Soil area			Soil area		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
Land preparation:						
Fertilizing	89	87	88	1.2	1.1	1.2
Liming	14	85	33	1.0	1.0	1.0
Seeding	100	100	100	1.2	1.7	1.3
Mowing	----	68	18	----	1.6	1.6
Fertilization:						
Lime	14	85	33	1,409	2,000	1,818
Basic slag	15	15	15	200	491	278
Mixed fertilizer	----	----	----	----	----	----
Nitrogen (N)	----	8	2	----	33	33
Phosphate (P_2O_5)	89	72	84	59	107	70
Potash (K_2O)	----	16	4	----	50	50
Seeding:						
Dallis grass	----	47	13	----	12	12
Lespedeza (common)	----	41	11	----	17	17
Lespedeza (Kobe)	14	7	12	20	30	21
White Dutch clover	42	49	44	8	6	7
Red clover	59	----	43	10	----	10
Crimson clover	----	9	2	----	20	20
Fescue	----	3	1	----	20	20

Table 24. Fertilization practices, open permanent pastures improved by fertilization, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Percentage of total acreage covered			Times over or rates where performed		
	Soil area			Soil area		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
Land preparation:						
Fertilizing	42	100	55	1.0	1.9	1.4
Liming	80	25	67	1.0	1.0	1.0
Mowing	67	54	64	1.2	1.4	1.2
Fertilization:						
Lime	80	40	71	2,203	2,415	2,231
Basic slag	14	75	28	80	902	590
Mixed fertilizer	----	3	1	----	100	100
Nitrogen (N)	----	----	----	----	----	----
Phosphate (P_2O_5)	42	56	45	89	63	82
Potash (K_2O)	9	32	23	90	71	76

Table 25. **Seeding practices, open permanent pastures, improved by seeding, 104 beef cattle farms, South Mississippi, July 1950-June 1951.**

Item	Percentage of total acreage covered			Times over or rates where performed		
	Soil area			Soil area		
	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
Land preparation:						
Seeding	100	----	100	1.0	----	1.0
Seeding:						
Dallis grass	30	----	30	5	----	5
Lespedeza (common)	26	----	26	20	----	20
Lespedeza (Kobe)	40	----	40	25	----	25
Rye grass	5	----	5	30	----	30

Table 26. **Percentage of improved permanent pastures improved by specified methods, 104 beef cattle farms, South Mississippi, July 1950-June 1951.**

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
Land preparation, fertilization and seeding	40.2	52.4	43.4
Land preparation and fertilization	7.4	.2	5.5
Land preparation and seeding	1.6	.9	1.4
Fertilization and seeding	6.5	6.8	6.6
Land preparation	1.9	1.3	1.7
Fertilization	14.1	12.1	13.6
Seeding	12.7	----	9.4
Mowing	15.6	26.3	18.4
Total	100.0	100.0	100.0

Table 27. Cost of establishment per acre for specified types of improved permanent pastures, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
		Dollars	
All improved permanent pastures:			
Land preparation[1]	6.12	6.73	6.29
Fertilizer	7.99	12.29	9.07
Seed	6.74	7.58	6.96
Total	20.85	27.60	22.32
Improved by land preparation, fertilization and seeding:			
Land preparation	7.60	7.62	7.61
Fertilizer	14.62	21.12	15.62
Seed	13.62	12.82	13.37
Total	35.48	41.56	36.60
Improved by fertilization and seeding:			
Land preparation	2.57	2.56	2.56
Fertilizer	4.61	11.66	6.49
Seed	6.87	11.30	8.06
Total	14.05	25.52	17.11
Improved by fertilization:			
Land preparation	.38	.73	.77
Fertilizer	8.06	11.65	9.26
Total	8.44	12.38	10.03
Improved by seeding:			
Land preparation	.91	----	.91
Seed	4.86	----	4.86
Total	5.77	----	5.77

[1] Includes the cost of applying fertilizer and seed.

Table 28. Annual cost per acre for specified types of improved permanent pasture, 104 beef cattle farms, South Mississippi, June 1950-July 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
	Annual cost (dollars)		
All improved permanent pastures:			
Land preparation	.81	1.02	.86
Fertilizer	2.70	4.91	3.27
Seed	.67	.76	.70
Bushing	.05	.19	.09
Fencing	.44	.66	.50
Mowing	1.32	1.54	1.37
Total	5.99	9.08	6.79
Improved by land preparation, fertilization and seeding:			
Land preparation	1.10	1.30	1.16
Fertilizer	4.93	7.78	5.82
Seed	1.36	1.28	1.34
Bushing	.04	.33	.13
Fencing	.48	.66	.54
Mowing	1.86	1.49	1.75
Total	9.77	12.84	10.74
Improved by fertilization and seeding:			
Land preparation	.54	.46	.51
Fertilizer	1.72	3.62	2.23
Seed	.69	1.13	.81
Bushing	----	----	----
Fencing	.34	.79	.46
Mowing	.25	1.32	.54
Total	3.54	7.32	4.55
Improved by fertilization:			
Land preparation	.12	.57	.22
Fertilizer	2.14	4.64	2.71
Bushing	----	.10	.02
Fencing	.36	.73	.44
Mowing	.99	.82	.95
Total	3.61	6.86	4.34
Improved by seeding:			
Land preparation	.09	----	.09
Seed	.49	----	.49
Bushing	----	----	----
Fencing	.44	----	.44
Mowing	.30	----	.30
Total	1.32	----	1.32
Improved by mowing:			
Mowing	2.19	2.16	2.18
Bushing	.24	----	.15
Fencing	.51	.58	.53
Total	2.94	2.74	2.86

Table 29. Annual cost per acre unimproved permanent pasture, woodland pasture, temporary winter pasture and temporary summer pasture, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area: Brown Loam	Soil area: Longleaf Pine	Average
	Dollars		
Unimproved permanent:			
Mowing	.02	.07	.03
Fencing	.37	.60	.40
Total	.39	.67	.43
Woodland:			
Fencing	.24	.40	.27
Temporary winter:			
Land preparation	2.93	2.48	2.81
Fertilizer	5.80	4.64	5.49
Seed	7.36	6.55	7.14
Mowing	.02	.03	.02
Fencing	.32	.44	.35
Total	16.43	14.14	15.81
Temporary summer:			
Land preparation	2.93	3.29	3.05
Fertilizer	----	1.07	.34
Seed	5.00	5.36	5.11
Fencing	1.07	1.43	1.18
Total	9.00	11.15	9.68

Table 30. Replacement cost and annual cost of one mile of fence[1], 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Quantity	Cost per unit	Total cost
		Dollars	Dollars
Replacement cost:			
Wire, 4-point barb	16 rolls	8.50	136.00
Staples	25 pounds	.12	3.00
Posts, untreated	528	.30	158.00
Labor	178 hours	.40	71.20
Hauling (tractor and trailer)	2.5 hours	1.00	2.50
Total			371.10
Annual cost:			
Depreciation			18.56
Repairs			15.96
Total			34.52

[1] Erected in the usual manner. About 60 percent used 4 strands; most of the balance used 3 strands. The replacement cost of one mile of fence with 3 strands of 4-point wire would be about $325.

Table 31. Acres of pasture per farm and per cow and annual pasture cost per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

	Soil area			Soil area		
Item	Brown Loam	Longleaf Pine	Average	Brown Loam	Longleaf Pine	Average
		Per farm		Per cow		
Acres:						
Improved permanent	85.9	58.6	76.7	1.6	2.4	1.8
Unimproved permanent	97.5	29.3	74.6	1.8	1.2	1.7
Temporary winter	14.7	10.4	13.2	.3	.4	.3
Temporory summer	.4	.3	.4	*[1]	*[1]	*[1]
Woodland	217.4	103.2	179.0	4.1	4.2	4.1
Total	415.9	201.8	343.9	7.8	8.2	7.9
Annual cost (dollars):						
Improved permanent[2]	515	532	521	9.74	21.54	12.02
Unimproved permanent[3]	38	20	32	.72	.81	.74
Temporary winter[3]	242	147	209	4.57	5.95	4.82
Temporary summer[3]	4	3	4	.08	.12	.09
Woodland	52	41	48	.98	1.66	1.11
Total	851	743	814	16.09	30.08	18.78

[1] Less than .05 acres.

[2] See Appendix Table 28.

[3] See Appendix Table 29.

Table 32. Pasture credits, improved permanent pasture, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

	Soil area		
Item	Brown Loam	Longleaf Pine	Average
Quantity per farm:			
Hay (tons)	12.5	2.1	9.0
White Dutch clover (lbs.)	229.5	4.6	153.6
Red clover (lbs.)	21.6	--	14.3
Crimson clover (lbs.)	----	54.2	18.6
Value (dollars):			
Per farm	376.10	56.23	268.44
Per acre	4.38	.96	3.50
Per cow	7.11	2.27	6.19

Table 33. Pasture credits, temporary winter pasture, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area: Brown Loam	Soil area: Longleaf Pine	Average
Quantity per farm:			
Hay (tons)	--------	.4	.1
Oats (bu.)	1.1	39.5	14.1
Red clover (lbs.)	152.2	-------	100.7
Value (dollars):			
Per farm	76.98	26.74	63.44
Per acre	5.24	3.53	4.81
Per cow	1.45	1.49	1.47

Table 34. Frequency and amount of overstocking and understocking, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Percent of farms over-stocked	Average amount (percent) overstocked	Percent of farms under-stocked	Average amount (percent) understocked
Brown Loam:				
Spring	1	10	36	35
Summer	3	15	30	34
Fall	6	14	25	31
Winter	30	29	7	22
Longleaf Pine:				
Spring	0	----	49	36
Summer	9	12	23	38
Fall	9	23	11	48
Winter	40	32	6	50
Total				
Spring	1	10	40	35
Summer	5	13	28	35
Fall	7	18	20	34
Winter	34	30	7	30

Table 35. What farmers did to overcome overstocking and understocking, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
	Percent of farmers following each method		
Overstocking in the spring:			
Nothing	100	------	100
Overstocking in the summer:			
Nothing	100	67	80
Improve pasture	------	33	20
Overstocking in the fall:			
Nothing	75	------	43
Feeding	25	67	43
Temporary pasture	------	33	14
Overstocking in the winter:			
Nothing	28	------	17
Feeding	67	71	69
Temporary pasture	------	29	11
Let cattle run out	5	------	3
Understocking in the spring:			
Nothing	65	69	67
Cut hay	12	------	7
Increase livestock numbers	23	31	26
Understocking in the summer:			
Nothing	57	50	55
Cut hay	14	------	10
Increase livestock numbers	29	50	35
Understocking in the fall:			
Nothing	82	25	71
Increase livestock numbers	18	75	29
Understocking in the winter:			
Nothing	80	------	57
Increase livestock numbers	20	100	43

Table 36. Source of water, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
	Percent		
Pond only[1]	35	34	35
Creek only[2]	20	20	20
Well only	3	12	6
Pond and creek	26	14	22
Pond and well	12	17	13
Well and creek	------	3	1
Pond, creek and well	4	------	3
Total	100	100	100

[1] Lakes classified as ponds.

[2] Branches and springs classified as creeks.

Table 37. Amount and value of feed used per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average	Soil area		Average
	Brown Loam	Longleaf Pine		Brown Loam	Longleaf Pine	
	Per farm			Per cow		
Quantity (pounds):						
Protein supplement[1]	3,444	2,666	3,182	65	108	73
Corn	13,591	14,152	13,779	257	573	318
Other[2]	454	243	384	9	10	9
Total concentrates	17,489	17,061	17,345	331	691	400
Legume hay	16,565	7,174	13,405	313	290	309
Other hay	29,703	14,433	24,563	562	584	567
Cottonseed hulls	9,461	2,686	7,181	179	109	166
Silage	17,985	1,770	12,528	340	72	289
Other[3]	4,840	3,979	4,550	91	161	105
Total roughage[4]	66,564	28,862	53,876	1,258	1,168	1,243
Value (dollars):						
Concentrates	471	434	459	8.90	17.57	10.59
Roughage	605	259	489	11.44	10.49	11.28
Total	1,076	693	948	20.34	28.06	21.87

[1] Includes cottonseed meal, cottonseed cake, cottonseed and soybean meal.

[2] Includes oats, milo and commercial mixed feeds.

[3] Includes cottonseed hulls, corn shucks and cobs, and corn fodder.

[4] Silage converted to hay euivalent.

Table 38. Marketing cost per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average	Soil area		Average
	Brown Loam	Longleaf Pine		Brown Loam	Longleaf Pine	
	Dollars per cow			Dollars per farm		
Commission fees	119	52	96	2.25	2.11	2.21
Hauling	15	6	12	.28	.24	.28
Other	1	1	1	.02	.04	.02
Total	135	59	109	2.55	2.39	2.51

Table 39. Miscellaneous cost per farm and per cow, 104 beef cattle farms, South Mississippi, July 1950-June 1951

Item	Soil area		Average	Soil area		Average
	Brown Loam	Longleaf Pine		Brown Loam	Longleaf Pine	
	Dollars per cow			Dollars per farm		
Veterinary fees and medicine	65	26	52	1.23	1.05	1.20
Spray materials and disinfectants	16	7	13	.30	.28	.30
Taxes	87	37	70	1.64	1.50	1.61
Feed grinding	17	36	23	.32	1.46	.53
Salt	40	13	31	.76	.53	.71
Minerals	10	5	8	.19	.20	.19
Hauling purchased feed	14	3	11	.27	.12	.25
Automobile	34	29	32	.64	1.18	.74
Other	7	4	6	.13	.16	.14
Total	290	160	246	5.48	6.48	5.67

Table 40. Fertilizer prices per ton, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Type of fertilizer	Price	Type of fertilizer	Price
	Dollars		Dollars
Ammonium nitrate	77.00	Phosphate, 18%	26.00
Nitrate of soda	65.00	Phosphate, 20%	29.00
Basic slag	14.95	Phosphate, 46%	57.00
Calcium silicate slag	4.40	0-14-7	28.20
Lime	5.50	0-16-20	48.00
Potash, 25%	29.25	6-8-8	47.80
Potash, 50%	56.40	5-10-5	45.00
Potash, 60%	65.00	8-8-8	52.60

Table 41. Feed prices, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Type of feed	Unit	Price	Type of feed	Unit	Price
		Dollars			Dollars
Cottonseed meal	cwt.	4.30	Cottonseed hulls	ton	18.00
Cottonseed cake	cwt.	3.80	Corn shucks and cobs	ton	10.00
Soybean meal	cwt.	4.00	Silage	ton	6.00
Cottonseed	cwt.	4.00	Legume hay[2]	ton	23.00
Corn[1]	bu.	1.22	Legume and grass hay[2]	ton	19.00
Oats	bu.	1.00	Grass hay[2]	ton	15.00
Milo	bu.	2.25			

[1] 56 pounds of grain.

[2] Hay was charged at $2 higher when baled, $2 lower when loose and $3 lower when stacked.

Table 42. Seed price per pound, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Type of seed	Price	Type of seed	Price
	Dollars		Dollars
Dallis grass	.75	Yellow hop clover	.60
Lespedeza (common)	.38	Button clover	1.00
Lespedeza (Kobe)	.16	Black Medic clover	.60
Lespedeza (Korean)	.10	Fescue	.70
Lespedeza (serecia)	.21	Rye grass	.12
White Dutch clover	1.08	Wild winter peas	.11
Ladino clover	1.87	Dixie wonder peas	.10
Crimson slover (H.S.)	.60	Austrian winter peas	.08
Crimson clover (S.S.)	.28	Vetch	.21
Red clover	.54	Sudan	.15
Alyce clover	.40	Oats	.05[1]
Alsike clover	.52	Wheat	.05
Lapacea clover	.60	Johnson grass	.50
Persian clover	.60	Bahia grass	.72

[1] $1.75 per bushel or $5.47 per cwt.

Table 43. Cost per acre, once over, for pasture land preparation and mowing, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Cost[1]		Cost[1]
	Dollars		Dollars
Discing	1.02	Applying fertilizer	.91
Breaking	2.24	Seeding	.91
Harrowing	.56	Mowing	1.26
Cultipacking	.64	Cultivating	.89

[1] Includes equipment, power and labor.

Table 44. Average price received for beef animals, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Soil area		Average
	Brown Loam	Longleaf Pine	
		Dollars per cwt.	
Cows, 2+	21.99	20.74	21.73
Heifers, 1-2	22.44	24.08	23.11
Bulls, 2+	23.63	24.07	23.78
Bulls, 1-2	19.72	20.54	19.82
Steers, 1+	28.84	28.03	28.75
Calves, 1-	30.17	29.99	30.14
Average for all animals	27.81	26.65	27.61

Table 45. Prices paid and received by farmers during specified periods as a percent of those paid and received for July 1950-June 1951.

Item	1945-1949	1940-1944	1935-1939	1935-1949
All commodities used in production	82.4	56.5	47.3	62.1
Feed	94.7	59.6	46.7	67.0
Motor supplies	83.9	69.7	67.1	73.6
Motor vehicles	79.7	56.1	48.8	61.5
Farm machinery	74.9	56.8	53.3	61.7
Farm supplies	87.1	67.6	54.7	69.8
Building and fencing material	76.4	49.6	42.8	56.3
Fertilizer	90.5	73.0	68.9	77.5
Seed	97.4	59.4	51.5	69.4
Taxes	80.2	61.7	60.1	67.3
Wage rates	91.3	47.3	27.1	55.2
Real estate	81.9	47.3	37.7	55.6
Beef cattle	62.6	34.0	18.4	38.3
Beef calves	62.9	35.6	20.3	39.6

Source: Agricultural Prices, U. S. D. A. and other reports of the U. S. D. A.

Table 46. Investment per cow, if the value placed on property had been at the level that prevailed during specified periods, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	July 1950-June 1951	1945-1949	1940-1944	1935-1939	1935-1949
			Dollars		
Brown Loam:					
Breeding herd	205	132	76	48	85
Land	227	186	107	85	126
Buildings	16	12	8	7	9
Total	448	330	191	140	220
Longleaf Pine:					
Breeding herd	205	132	76	48	85
Land	239	196	113	90	133
Buildings	28	21	14	12	16
Total	472	349	203	150	234
Average all farms:					
Breeding herd	205	132	76	48	85
Land	230	188	109	86	128
Buildings	18	14	9	8	10
Total	453	334	194	142	223

Table 47. Annual cost per cow, if prices paid had been those that prevailed during specified periods, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	July 1950-June 1951	1945-1949	1940-1944	1935-1939	1935-1949
			Dollars		
Brown Loam:					
Pasture	16.09	14.02	10.04	9.00	11.02
Feed	20.34	19.26	12.12	9.49	13.62
Buildings	2.40	1.83	1.19	1.02	1.35
Labor	7.09	6.47	3.35	1.93	3.92
Marketing	2.55	1.66	.96	.60	1.07
Miscellaneous	5.48	4.59	3.55	3.12	3.75
Total	53.95	47.83	31.21	25.16	34.73
Longleaf Pine:					
Pasture	30.08	26.36	19.15	17.21	20.91
Feed	28.06	26.56	16.72	13.12	18.80
Buildings	3.56	2.71	1.78	1.54	2.01
Labor	11.56	10.49	5.43	3.12	6.35
Marketing	2.39	1.58	.89	.57	1.01
Miscellaneous	6.48	5.38	4.17	3.68	4.41
Total	82.07	73.08	48.14	39.24	53.49
Average all farms:					
Pasture	18.78	16.47	11.76	10.52	12.92
Feed	21.87	20.72	13.03	10.22	14.66
Buildings	2.63	2.01	1.31	1.13	1.48
Labor	7.94	7.24	3.76	2.15	4.38
Marketing	2.51	1.64	.95	.59	1.06
Miscellaneous	5.67	4.75	3.67	3.23	3.88
Total	59.40	52.83	34.48	27.84	38.38

Table 48. Annual returns per cow, if prices received and paid had been those that prevailed during specified periods, 104 beef cattle farms, South Mississippi, July 1950- June 1951.

Item	July 1950-June 1951	1945-1949	1940-1944	1935-1939	1935-1949
			Dollars		
Brown Loam:					
Value of beef produced	90.36	56.75	31.44	17.52	35.24
Pasture credits	8.56	8.22	5.10	4.20	5.84
Total returns	98.92	64.97	36.54	21.72	41.08
Less total costs	53.95	47.83	31.21	25.16	34.73
Return to investment	44.97	17.14	5.33	—3.44	6.35
Percent return to investment	10.0	5.2	2.8	—2.5	2.9
Longleaf Pine:					
Value of beef produced	82.15	51.88	28.58	15.95	32.04
Pasture credits	3.76	3.60	2.23	1.86	2.56
Total returns	85.91	55.18	30.81	17.81	34.60
Less total costs	82.07	73.08	48.14	39.24	53.49
Return to investment	3.84	—17.90	—17.33	—21.43	—18.89
Percent return to investment	.8	—5.1	—8.5	—14.3	—8.1
Average all farms:					
Value of beef produced	88.93	55.85	30.96	17.25	34.69
Pasture credits	7.66	7.36	4.57	3.76	5.23
Total returns	96.59	63.21	35.53	21.01	39.92
Less total costs	59.40	52.83	34.48	27.84	38.38
Return to investment	37.19	10.38	1.05	—6.83	1.54
Percent return to investment	8.2	3.1	.5	—4.8	.7

Table 49. Comparison of various factors and practices on the most profitable and least profitable farms, 104 beef cattle farms, South Mississippi, July 1950-June 1951.

Item	Brown Loam		Longleaf Pine	
	Most profitable	Least profitable	Most profitable	Least profitable
Number of farms	20	20	10	10
Number of cows	57	47	24	18
Total investment per cow (dollars)	423	456	567	482
Average value of cows (dollars)	169	161	170	141
Average value of mature bulls (dollars)	567	357	382	348
Improved permanent pasture (acres per cow)	1.0	1.1	3.4	2.2
Unimproved permanent pasture (acres per cow)	1.9	3.3	1.2	1.9
Woodland pasture (acres per cow)	4.9	4.9	2.6	7.2
Temporary winter pasture (acres per cow)	.1	.1	.4	.9
Roughage (pounds per cow)	815	1802	650	2039
Protein supplement (pounds per cow)	53	76	83	99
Other concentrates (pounds per cow)	134	455	444	1374
Calf crop (percent)	73	64	73	90
Calves dying (percent)	1.7	7.2	7.2	4.5
Cows dying (percent)	1.2	7.5	.7	3.9
Calves born in Jan., Feb., and March (percent)	45	24	48	54
Average weight of calves sold	376	306	385	369
Years in commercial beef production	21	15	8	5
Labor used per cow (hours)	17	25	23	44
Beef produced per cow (pounds)	386	190	352	368
Price received for beef (dollar per cwt.)	27	28	30	24

Table 50. Returns, costs and returns to investment per cow on the most profitable farms, if prices received and paid had been those that prevailed during specified periods, 104 beef cattle farms, South Mississippi, Juuly 1950-June 1951.

Item	July 1949-June 1950	1945-1949	1940-1944	1935-1939	1935-1949
Brown Loam:					
Value of beef produced	103	65	36	20	40
Pasture credit	5	5	3	2	3
Total returns	108	70	39	22	43
Feed	13	12	8	6	9
Pasture	11	10	7	6	8
Labor	7	6	3	2	4
Buildings	2	2	1	1	1
Marketing	2	1	1	1	1
Miscellaneous	5	4	3	3	3
Total costs	40	35	23	18	26
Return to investment	68	35	16	4	17
Percent return to investment	16	11	9	3	8
Longleaf Pine:					
Value of beef produced	106	67	37	21	41
Pasture credit	6	6	4	3	4
Total returns	112	73	41	24	45
Feed	19	18	11	9	13
Pasture	31	27	20	18	22
Labor	9	8	4	2	5
Buildings	3	2	1	1	2
Marketing	3	2	1	1	1
Miscellaneous	6	5	4	3	4
Total costs	71	62	41	34	47
Return to investment	40	11	0	–10	–2
Percent return to investment	7	3	0	–6	–1

[1] Less than $0.50.

no. 519

BULLETIN 519 MAY, 1954

ATTITUDES OF RURAL SCHOOL CHILDREN TOWARDS SEVERAL FOOD PRODUCTION AND CANNING ACTIVITIES

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ATTITUDES OF RURAL SCHOOL CHILDREN TOWARDS SEVERAL FOOD PRODUCTION AND CANNING ACTIVITIES

By Dorothy Dickins, Virginia Ferguson, and Alex Fanelli

INTRODUCTION

How more home-produced meat, eggs and vegetables may be included in the diets of rural families is a problem concerning which home economists and nutrition specialists are particularly concerned. Lack of money, poor land, poor management, lack of knowledge as to most efficient farming methods and of the value of proper diets are factors recognized for many years as contributing to an inadequate home-produced food supply ultimately resulting in poor diets. Inadequate food production is not usually made up by purchase of food in the market.

Much research has been carried on to determine causes and offer solutions for these problems. Attitudes and feelings of the people actually involved are, however, too seldom taken into account. Research workers in various sections of the country are arriving at the realization that replies to such common sense questions as "What do you think?" "How do you feel about this?" when directed at representative samples of people in particular areas may sometimes offer clues which years of other types of study may have failed to uncover.

The present study of children's attitudes is a complementary one to a study of the home-produced food supply of farm families of Quitman and Tate Counties, Mississippi, made recently by one member of the Home Economics Department. [1] It was realized that attitudes of children toward production activities are important not only to the parental family but to the boys and girls. Many of these youths will be farmers and farmers' wives in the not-too-distant future. Data on how children feel about food production and canning, whether favorable, unfavorable, or neutral, and reasons for same can serve as a basis for developing more effective education programs in rural homes, schools, and youth groups.

METHODS AND SCOPE OF STUDY

The Picture Tests. The method of determining children's attitudes used in this study was having the children answer four questions concerning each of five photographs depicting scenes in which children were carrying on specified food production activities either alone or in a family group. The picture technique is being used by some other investigators, but none to our knowledge as in this study. Most of these investigators use drawings rather than photographs. Sperry, however, is using photographs of actual children as in this study, but his subjects are asked to tell a story about the picture. [2]

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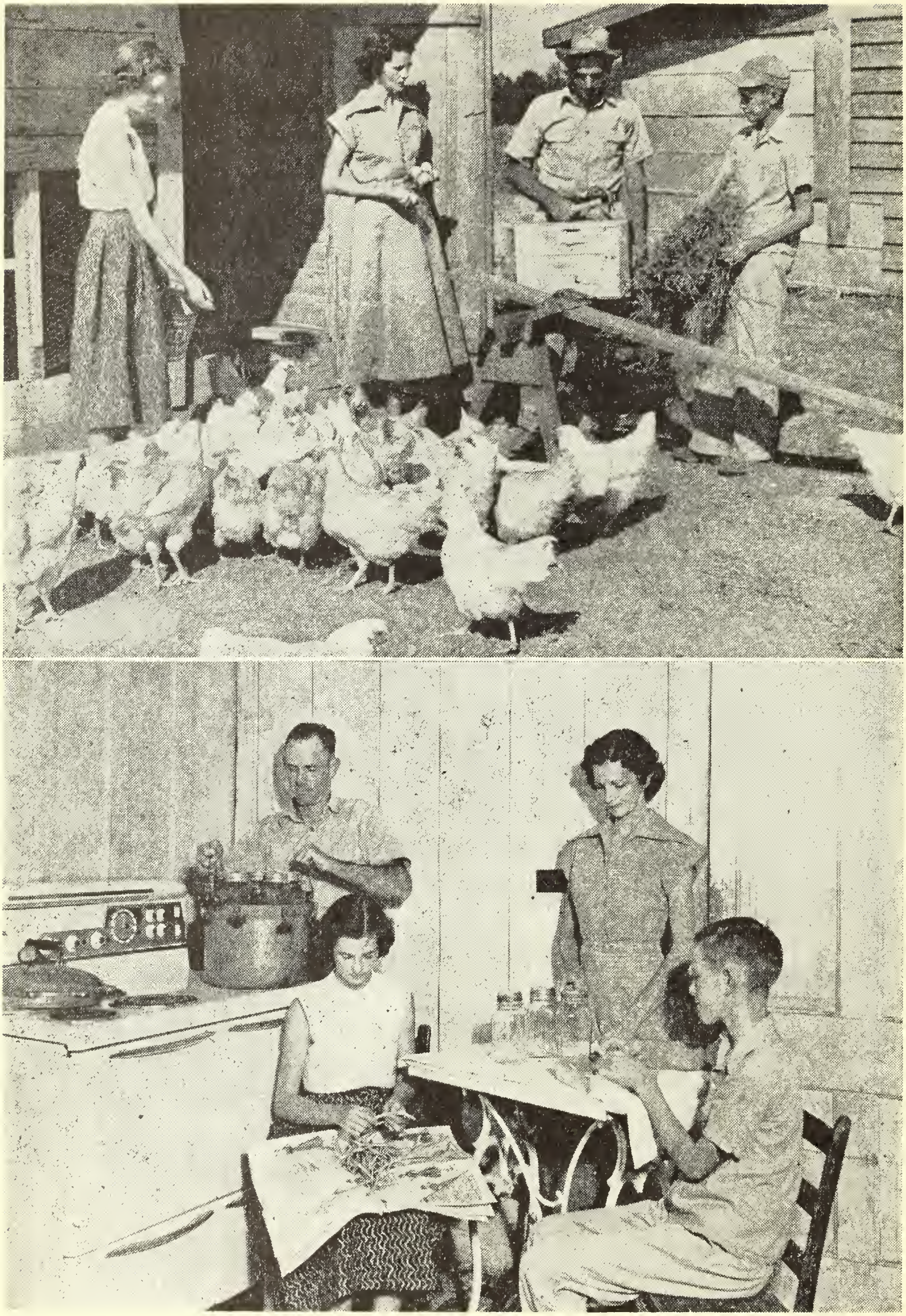
[1] The Home-Produced Food Supply of Non-Owner Farm Families, Dorothy Dickins, Mississippi Agricultural Experiment Station Bulletin 512, March, 1954.

[2] New Techniques for Studying Children, I. V. Sperry and B. C. Boggs, Journal of Home Economics, Vol. 42, No. 9. pp. 723-726.



Family poultry and canning—pictures shown white boys and girls.

The four questions about each photograph asked children of this study were: (1) How do you think this boy (girl) gathering sweet potatoes (or whatever the activity in the picture happened to be) feels about doing this? (2) Why do you think he (she) feels this way? (3) How would you feel if you were the boy (girl) in the picture? (4) Why would you feel this way?

Fourteen photographs—seven of white children and their families and an exact duplicate of Negro children and their families were used. These are photographs of two Mississippi families, taken on their own farms. The scenes depicted in the pictures were as follows:

(1) The four family members harvesting sweet potatoes. The husband is plowing up the potatoes and the wife and children are picking them up and stacking them.

(2) The family group working together with poultry—each engaged in a normal activity for that person.

(3) The four family members canning cow peas in their kitchen —wife packing jars, husband lifting jars out of the pressure cooker, children shelling cow peas.

(4) Boy picking up and stacking sweet potatoes (alone).

(5) Boy feeding and tending chickens (alone).

(6) Girl shelling cow peas for canning (alone).

(7) Girl feeding and tending hogs (alone).

Each child was shown the first three pictures and numbers (4) and (5) if a boy, and numbers (6) and (7) if a girl. (See pictures in bulletin and picture on cover.)

Selection of children. This study was made in Quitman and Tate counties, Mississippi. It included 400 children in the seventh, eighth, and ninth grades (50 white and 50 Negro—25 boys and 25 girls—in each of the two county seat town schools [3/] and 50 white and 50 Negro children in county schools of each county [4/]. In all cases, children to be tested were randomly selected from school records.

In addition, a sample of children retarded in school (i.e., children 13-16 years in sixth grade or under) was included. Since many children, especially Negro children in schools in rural areas are retarded, it was thought desirable to include a sample of such children. otherwise the study would not really represent attitudes of rural children towards such activities as the ones under investigation. These children are for the most part not mentally retarded, but are often

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[3/] Since only 14 Negro boys and 16 Negro girls were available in the Senatobia school in these three grades, the difference was made up in the Coldwater school, the town next in size to Senatobia in the county. The population of these three towns in the 1950 census was: Marks, 2209, Senatobia, 2108, Coldwater, 949.

[4/] In selecting the sample of county schools to be included, these schools were classified into two groups (1) those with a high school department (2) those with no high school department (elementary grades only). One school of each type was drawn and the number of children included in each type according to total enrollment in 7-8-9 grades in these 2 types. If it was necessary to get the number of children needed, a second school was drawn.

children who have not attended school regularly.[5]

Retarded children were sampled in the same proportion as were children from the 7-8-9 grades. Thus, if there were 100 children in these three grades and 50 were sampled, the proportion of retarded children sampled would be 50 percent. If in the same school there were 20 retarded children, then 10 (or 50 percent) would be included in the study. A total of 114 retarded children were included (28 white children—21 boys and 7 girls—and 86 Negro children —41 boys and 45 girls). In the sample, therefore, there are a total of 514 children. See Appendix for further discussion of sample.

Collection of data. Children in the seventh, eighth, and ninth grades wrote replies to questions about each picture. Each child worked separately with a set of pictures and forms in which provision was made for recording replies to questions. Provision was also made on these forms for recording the frequency of performing the activity pictured. Retarded children gave their replies orally alone with the investigator. The children were allowed to take as much time as they wanted, whether taking the written or the oral test. The order in which the pictures were presented to the children was varied to eliminate any bias that might have been due to seeing a certain picture first or last. After the children completed the questions about each of the five pictures, they were asked to fill out or to furnish information on a classification sheet.

Data were obtained by one of the investigators from children in all schools for white children by methods described above. Negro teachers and a few senior girl students obtained the data from children in all schools for Negro children. These Negro women and girls were trained and supervised by the investigator. Data were obtained during February and March, 1953. This is a period of maximum school attendance, before the cotton crop season. Cotton farming is the predominant type of farming in the State as well as in the two counties selected. (For further discussion of the methods used, see the appendix.)

THE CHILDREN

The percentage distribution by age of the 514 white and Negro boys and girls included in this study was as follows:

Age group	119 white boys	141 Negro boys
Below 13 years	18	3
13 - 15 years	80	63
16 years and over	2	34

Age group	109 white girls	145 Negro girls*
Below 13 years	22	4
13 - 15 years	75	74
16 years and over	3	21

* No report on age from one child.

As will be noted, most children in all groups were 13-15 years of age. Since there were more white

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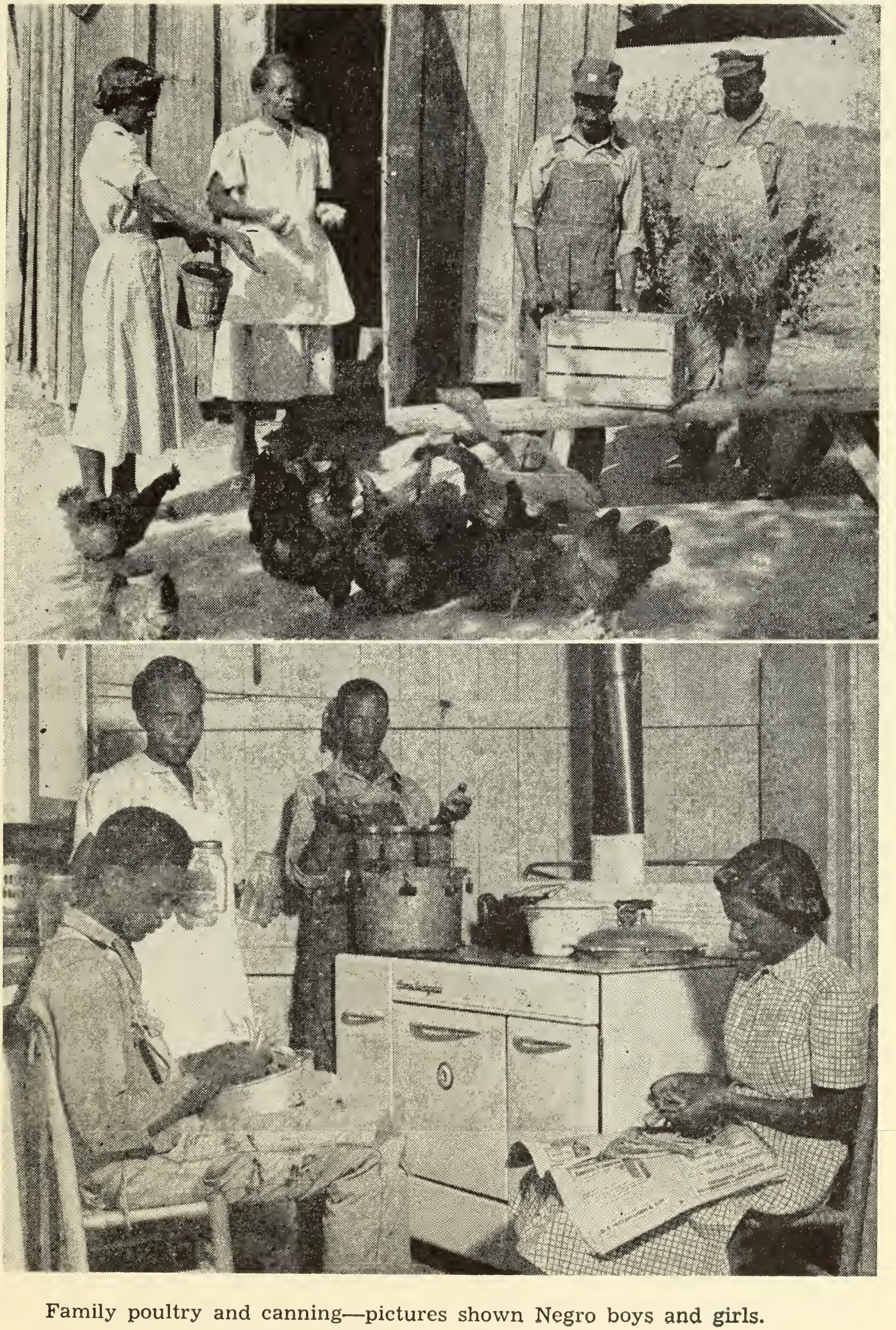
[5] We have no reason to believe that these retarded children are different from other children. In fact, differences in percentages of total activities favored by these children and other children were not statistically significant. Three-fourths of the retarded children were Negro children.



Family poultry and canning—pictures shown Negro boys and girls.

children advanced in school for their age and more Negro children retarded in school for their age, white children in the sample were on the whole somewhat younger than Negro children. Negro boys were more retarded than Negro girls. The seventh, eighth, and ninth grade sample of Negro boys and girls included some individuals 18-19-20 years of age. Three Negro children were 20 years; 2 Negro children were 19 years; and 10 Negro children were 18 years. The oldest white child (one boy) was 18 years.

Children were asked on the classification sheet to check or fill in "What the head of your family does for a living":

Farm owner ____________
Farm manager ____________
Farm renter ____________
Farm shareworker ____________
Other farm work ____________
Government payments ____________

Other types of work for pay
Grocery store owner, clerk, teacher, cook, janitor, truck driver, road work

If yes, write what ____________

If the child checked (or reported) a farm occupation, even though he had also given a non-farm occupation or checked government payments, his family was classified as a farmer. The fact that the head of the family did farm work was considered significant for this study.

The family head was reported as doing some kind of farm work by 78 percent of the white children and 80 percent of the Negro children. The percentage distribution of white and Negro children by occupation of family head was:

Occupation of family head	White children	Negro children
Farm owner	30	18
Farm manager or renter	25	28
Farm shareworker or other farm work	23	34
Non-farm work	21	16
Government payments	1	4

"Other farm work" is farm wage work. Farm shareworkers included both sharecroppers and share tenants. The term shareworkers was used since it is the term which families generally use to designate these farm tenures.

Very few of the children were taking either agriculture or home economics. These courses are generally not offered until the ninth grade. But a number of the children included were 4-H Club members. The 4-H Club is open to children 10 years of age and over. About four-tenths (39 percent) of the white children and six-tenths (61 percent) of the Negro children in this study reported that they were members of the 4-H Club.

The proportion of children in the two counties who were 4-H Club members was roughly estimated from reports on file in the office of the 4-H Club leader of the Extension Service and from the 1950 census on number males and females 10 through 19 years of age in the two counties. According to this estimate, approximately 43 percent of the children in Quitman County and 38 percent in Tate County were 4-H Club members. Forty-five percent of the Quitman County children in this study and 57 percent of those from Tate County reported they were 4-H Club members. The Tate County sample, therefore, included a relatively larger number of club members, the Quitman County sample about the same as in the county as a whole. The Negro children (especially Negro girls) in the Tate County sample are responsible for the high 4-H Club membership, rather than the white children. Evidently the Negro schools in the sample had an unusually large number of 4-H Club members.

Forty-seven percent of the white children and 40 percent of the Negro children in this study who were 4-H Club members had entered a production or food preservation contest at some time during their club membership. This shows that many of the 4-H Club members were very active members.

GENERAL ATTITUDE OF CHILDREN TOWARDS ACTIVITIES

The child's general attitude was obtained from replies which he gave to questions (3) and (4) i.e., How would you feel if you were the boy (girl) in the picture? Why would you feel this way? If all or the majority of comments were favorable to the activity then his attitude was classified as favorable. If all, or the majority of comments were unfavorable to the activity, then his attitude was classified as unfavorable. Neutral attitudes included those in which it was not possible to determine whether comments were favorable or unfavorable. Also included in this category were replies which could not be deciphered and record sheets with no report.

These children did not always agree in the responses as to how the boy (girl) in the picture felt about the activity and how they themselves felt. In fact, it was found that they could shift from a favorable attitude for the boy (girl) in the picture to an unfavorable attitude for themselves or vice versa. This indicates that question (3) responses were independent of responses to question (1). It was assumed, therefore, that the child's responses to questions (3) and (4) were valid measures of his attitudes towards the various activities. For further discussion see the appendix.

Attitudes of the majority of white and Negro boys and girls were favorable to all activities pictured with two exceptions (Tables 1 and 2). Only 49 percent of the white boys and 46 percent of the Negro girls were favorable to the activity of shelling peas (boy) and feeding hogs (girl). These activities are traditionally production activities of the other sex. Work with poultry was a popular activity in all groups.

Feeding chickens was least popular with the Negro boy. This finding may be related to the fact that the Negro boys in the sample were older. In other words, feeding chickens might be a suitable activity for younger boys, but not such a good activity for older boys. This point will be discussed further in the section of the report pertaining to reasons for attitudes given by children.

Frequency of Doing the Activity: Children in this study were more likely to report favorably those activities which they were accustomed to doing. One might well ask: Of all the favorable responses, what percentage was by those who had done the activity frequently? Of all the unfavorable responses, what percentage was by those who had done the activity frequently? These were:

Girl alone feeding hogs—picture shown white girls and family harvesting sweet potatoes—picture shown white boys and girls.

	Percentage of all **favorable** responses by those with frequent experience	Percentage of all **unfavorable** responses by those with frequent experience
White boys	58	48
Negro boys	64	45
White girls	57	29
Negro girls	65	35

Building hen nests seemed especially attractive to boys. This is an activity in which only about 40 percent of the boys reported doing often, yet most boys made favorable comments about such an activity for themselves. Building hen nests was an exception to the finding that children like what they do. Does this have any relation to the attractiveness of carpentering and working with tools?

Table 1. Attitudes towards specified food production and canning activities by white and Negro boys.

	PRODUCTION OR CANNING ACTIVITY				
Attitudes	Building hen nests (family)	Feeding chickens (alone)	Shelling peas (family)	Stacking sweet potatoes (alone)	Stacking sweet potatoes (family
	Percent	Percent	Percent	Percent	Percent
		White Boys			
Favorable	91	93	49	80	68
Unfavorable	7	5	48	17	28
Neutral	2	2	3	3	4
Number boys	119	119	119	119	119
		Negro Boys			
Favorable	89	81	69	79	81
Unfavorable	9	15	27	18	16
Neutral	2	4	4	3	3
Number boys	141	141	141	141	141

Table 2. Attitudes towards specified food production and canning activities by white and Negro girls.

	PRODUCTION OR CANNING ACTIVITY				
Attitudes	Feeding chickens (family)	Feeding hogs (alone)	Shelling peas (family)	Shelling peas (alone)	Stacking sweet potatoes (family)
	Percent	Percent	Percent	Percent	Percent
		White Girls			
Favorable	86	54	72	63	60
Unfavorable	10	41	25	30	35
Neutral	4	5	3	7	5
Number girls	109	109	109	109	109
		Negro Girls			
Favorable	90	46	86	75	68
Unfavorable	8	51	12	22	31
Neutral	2	3	2	3	1
Number girls	145	145	145	145	145

Parental Family Occupation. A comparison of percentage of children favoring activities by occupation of parental family, i.e., farm owner, farm non-owner, and non-farmer shows few important differences. These percentages are:

	Farm Owner	Farm Non-Owner	Non-Farmer
White boys	78	73	82
Negro boys	83	80	79
White girls	69	73	55
Negro girls	67	73	77

The little difference in percentage favoring by occupation of parental family may be related to the type of pictures shown. The foods about which these activities centered were those ordinarily produced by low as well as by high income families. They did not require any large investment in money. Furthermore, they were activities carried on by many small town families, non-farm as well as farm.

Greatest differences found in children by family occupation were among girls. Differences of these children were especially large in feeding hogs and stacking potatoes. The percentage of white girls with a parental family a farmer and a non-farmer who had favorable attitudes towards these two activities were:

	Farmer	Non-Farmer
Feeding hogs	61	29
Stacking potatoes	66	38

4-H Club Membership: Of all the favorable responses what percentage was by 4-H Club members? Of all the unfavorable responses what percentage was by 4-H Club members? Are there important differences? An answer to these questions is found in the summary below:

	Percentage of all favorable responses by those who were 4-H Club members	Percentage of all unfavorable responses by those who were 4-H Club members
White boys	48	41
Negro boys	56	34
White girls	35	21
Negro girls	77	61

Differences were greater for Negro than for white children.

Biggest differences in attitudes of boys who were and who were not 4-H Club members were found to be in attitudes regarding less popular production tasks. This finding might be illustrated by comparing the percentage of boys who favored building hen nests (a more popular activity) and who favored shelling peas (a less popular activity). These percentages were:

	White Boys		Negro Boys	
	4-H Club Member	Non-Member	4-H Club Member	Non-Member
Building hen nests	96	94	88	81
Shelling peas	53	49	85	60

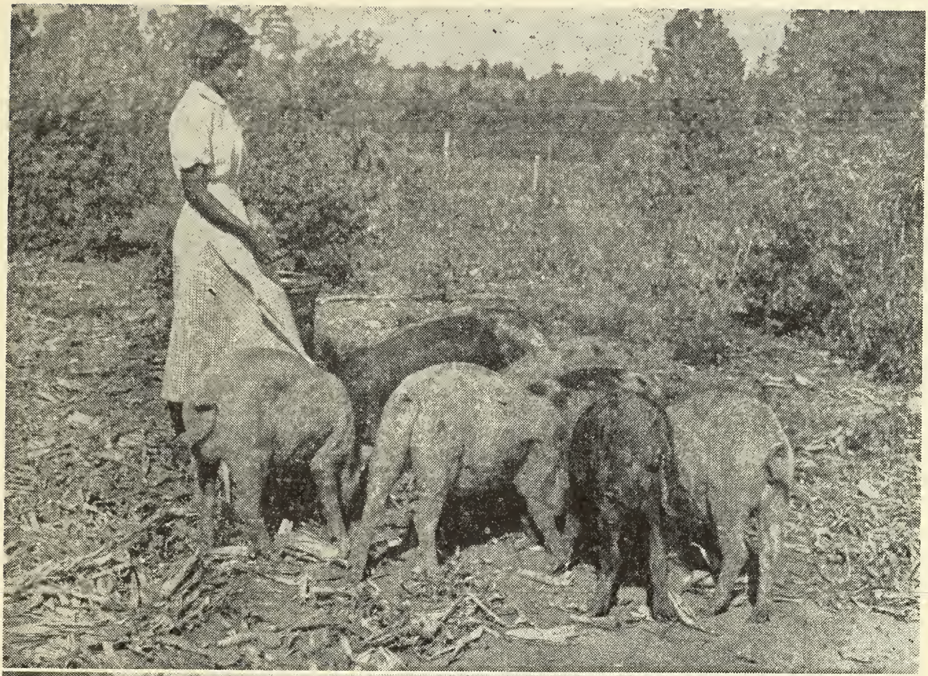
Both members and non-members gave favorable responses to the more popular task (building hen nests). But relatively more 4-H Club boys were favorable to the more unpopular task (shelling peas). But the difference in percentages for 4-H Club members and non-members was not statistically significant for white boys.

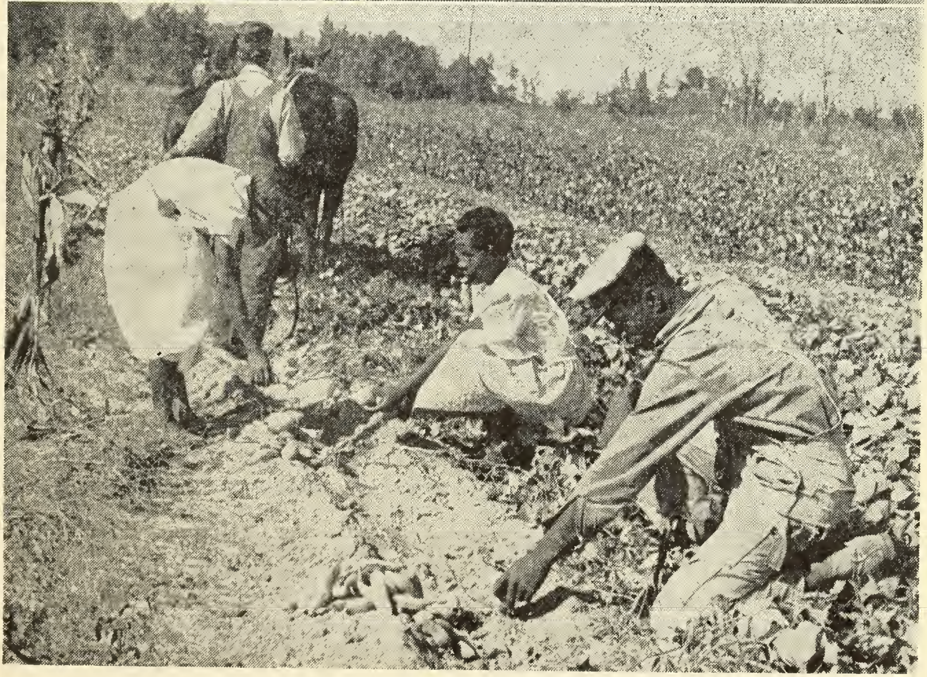
Similar differences were found in attitudes of 4-H Club and non-Club members among girls. Differences in percentages of girl 4-H Club members and non-members favoring feeding chickens (a popular task) and stacking potatoes (a more unpopular task) is a good example. These percentages are as follows:

	White Girls		Negro Girls	
	4-H Club Member	Non-Member	4-H Club Member	Non-Member
Feeding chickens	97	86	93	87
Stacking potatoes	75	60	76	46

Differences between members and non-members were greater for unpopular tasks with Negro than with white children.

Liking the Foods. On the classification sheet the children were asked how they felt about eggs to eat, sweet potatoes to eat, home canned peas to eat, fryers to eat, hens to eat, and pork meat (if a girl) to eat, and to check whether or not they are very good ________





Girl alone feeding hogs—picture shown Negro girls and family harvesting sweet potatoes—picture shown Negro boys and girls.

good ________ fair ________ not good ______ Shown below is the percentage of children in each of the four groups who rated these foods either as very good or good.

Food	White boys	Negro boys	White girls	Negro girls
Eggs	85	92	69	88
Fryers	96	92	86	93
Hens	74	81	70	87
Home canned peas	76	72	64	68
Sweet potatoes	79	93	85	91
Pork meat	—	—	77	73

The fact that all the pictures dealt with popular foods was no doubt one factor in the high proportion favoring activities in connection with producing them. In fact, in reasons given for feeling as they did about the activity, the good food resulting was the one most often given.

Quitman and Tate County Children. About the same percentage of white boys and girls in Quitman and in Tate County favored activities pictured. But more Negro boys and girls in Tate than in Quitman County favored the activities. The percentage of the total pictures favored by white and Negro boys and girls in the two counties was:

	Quitman County	Tate County
White boys	76	76
Negro boys	75	86
White girls	68	73
Negro girls	66	82

Differences in attitude of Negro children in the two counties is related to the larger sample of 4-H Club members in the Tate County Negro sample.

REASONS FOR FAVORING OR NOT FAVORING PRODUCTION ACTIVITIES

In replies of the children to question (2) Why do you think he (she) feels this way? and to question (4) Why would you feel this way?, reasons for attitudes are given. Some children gave many reasons, others only a few. Some gave no specific reason or reasons but merely stated that they liked or did not like the activity. An example of this type of report is: "I would feel happy because I like to do it".

All reasons given by the children whether for the child in the picture or for himself, were in this study regarded as the child's reasons with two exceptions. These exceptions were (1) "picture reasons" (2) reasons given why the boy (girl) in the picture feels this way when the general attitude for child in the picture and for child himself disagreed.

A "picture reason" is a reason which the child could not have given without seeing the picture. In response to question (2) the child may say, for example, "I know he likes stacking potatoes **because he is smiling"**. Here the reason given for the favorable attitude is clearly a function of the stimulus (the picture) and offers no clue to the respondent's own feelings about the activity. Thus, we have to "screen out" reasons of this type in any analysis of the reasons behind the attitudes of our sample. Similarly, if a boy says the boy in the picture "feels bad" (question 1) but that he himself would "feel good" (question 3) we cannot count the reasons given for the first attitude as those of the respondent. In other words, wherever there is a shift in attitude between questions 1 and 3, we are limited to the reasons given in response to question 4 if we are trying to discover why the respondent feels the way he does. In all **other** cases, however, it seems reasonable to suppose that in answering question 2 the respondent is projecting his own feelings into the child in the picture. (This assumption is supported by the fact that many children in responding to question 4 simply reiterate the reasons given in answer to question 2).

The percentage of children from each of the 4 groups giving different types of reasons is shown in Tables 3-6. A child may have given several reasons of the same type for favoring or not favoring or only one. In either case, he was given credit for having given this type of reason.

The leading reasons for favoring the activity were the good food resulting, food for use **now** or in the **future**, and the opportunity which the activity provided for helping Mother and Dad, other members of the family, or other people. Desire to care for animals, or just plain liking the animal was, however, an important reason in all groups for favoring activities. Especially is this significant considering the fact that children had

Table 3. Reasons given for favoring and not favoring specified food production activities by the 119 white boys.*

Reasons	PRODUCTION AND CANNING ACTIVITIES					
	Building hen nests (family)	Feeding chickens (alone)	Shelling peas (family)	Stacking sweet potatoes (alone)	Stacking sweet potatoes (family)	Total No. of reasons
For Favoring	Percent	Percent	Percent	Percent	Percent	
Helping	43	23	30	26	29	180
Food	10	13	19	24	22	105
Farm animals	38	45	—	—	—	99
Fun, interesting	24	13	3	16	9	79
Duty	14	16	10	13	13	79
Easy, pleasant	9	15	8	13	9	65
Ownership, accomplishment	5	6	3	18	7	45
Money	4	10	1	9	8	38
Personal benefit	10	3	3	7	6	33
Location	2	4	2	7	6	24
Used to it	7	5	2	2	2	20
Other people	2	0	3	0	8	14
All other**	12	12	3	16	12	64
For NOT Favoring						
No fun, not interesting	3	2	19	5	11	48
Hard, unpleasant	3	2	15	5	11	42
Makes sore, tired	2	0	12	5	16	41
Location	0	0	11	1	8	23
Not suitable for sex, age, position	0	1	9	0	1	13
Don't like animals, afraid of them	1	2	—	—	—	3
Would or wouldn't want company	0	0	0	1	0	1
All other	3	2	8	8	12	37
No Specific Reason Given	8	5	9	7	6	41

* No entry indicates that the reason would not apply to the particular picture.

A zero (0) indicates that the reason might have been given but was not.

** Tables giving percentage of children in each of the four groups giving specified types of reasons classified in this "all other" group can be obtained from the Home Economics Department of the Mississippi Agricultural Experiment Station.

Table 4. Reasons given for favoring and not favoring specified food production activities by the 141 Negro boys.*

Reasons	PRODUCTION AND CANNING ACTIVITIES					
	Building hen nests (family)	Feeding chickens (alone)	Shelling peas (family)	Stacking sweet potatoes (alone)	Stacking sweet potatoes (family)	Total No. of reasons
For Favoring	Percent	Percent	Percent	Percent	Percent	
Food	24	21	41	46	37	239
Helping	26	11	22	13	18	129
Money	12	10	10	14	14	85
Farm animals	33	26				82
Duty	13	13	6	6	6	64
Ownership, accomplishment	8	8	5	13	6	59
Fun, interesting	13	7	1	4	2	40
Easy, pleasant	6	7	5	1	5	35
Personal benefits	8	4	5	3	4	34
Used to it	1	4	1	1	3	15
Location	1	1	1	2	4	13
Other people	2	0	1	0	6	12
All other**	6	8	8	13	14	71
For NOT Favoring						
Not suitable for sex, age, position	0	4	11	0	1	22
Hard, unpleasant	1	1	6	4	4	22
No fun, not interesting	4	1	2	1	6	20
Makes sore, tired, hurts	1	1	5	2	3	17
Would or wouldn't want company	0	1	0	4	1	9
Location	0	0	2	1	2	8
Don't like or afraid of animals	1	2	---	--	----	4
All other	3	6	8	3	2	31
No Specific Reason Given	8	13	12	13	14	86

* See footnote *, Table 3.
** See footnote **, Table 3.

Table 5. Reasons given for favoring and not favoring specified food production activities by the 109 white girls.*

Reasons	Production and Canning Activities					
	Feeding chickens (family)	Feeding hogs (alone)	Shelling peas (family)	Shelling peas (alone)	Stacking sweet potatoes (family)	Total No. of reasons reasons
For Favoring	Percent	Percent	Percent	Percent	Percent	
Helping	21	10	38	27	30	137
Food	15	9	17	15	20	83
Farm animals	45	29				81
Duty	17	9	17	15	11	76
Fun, interesting	18	9	15	16	10	74
Easy, pleasant	14	2	9	15	4	47
Location	7	9	1	2	14	36
Personal benefits	2	4	7	7	4	27
Used to it	8	4	4	6	1	25
Other people	0	0	14	6	4	25
Money	10	6	2	1	4	24
Ownership, accomplishment	8	3	4	3	3	22
All other**	14	9	11	11	10	60
For NOT Favoring						
Hard, unpleasant	0	14	8	6	16	48
Not suitable for sex, age, position	3	20	3	1	4	33
No fun, not interesting	2	4	9	8	6	31
Makes sore, tired, hurts	0	3	3	7	16	31
Don't like or afraid of animals	4	22				28
Location	2	4	4	2	15	28
Would or wouldn't want company	0	0	4	9	0	14
All other	3	12	9	7	15	50
No Specific Reason Given	10	11	10	15	7	58

* See footnote *, Table 3.
** See footnote **, Table 3.

Table 6. Reasons given for favoring and not favoring specified food production activities by the 145 Negro girls.*

Reasons	Production and Canning Actitvities					
	Feeding chickens (family)	Feeding hogs (alone)	Shelling peas (family)	Shelling peas (alone)	Stacking sweet potatoes (family)	Total No. of reasons
	Percent	Percent	Percent	Percent	Percent	
For Favoring						
Food	25	16	41	30	36	215
Helping	13	10	31	19	24	142
Money	19	12	12	6	9	82
Duty	11	10	14	12	6	76
Fun, interesting	10	3	10	12	10	65
Farm animals	30	12				62
Easy, pleasant	6	1	5	8	3	32
Ownership, accomplishment	6	3	6	3	2	32
Personal benefit	3	3	6	3	3	27
Used to it	4	1	3	2	1	18
Other people	1	0	8	2	3	20
Location	1	0	0	1	3	7
All other**	11	6	10	16	6	70
For NOT Favoring						
Not suitable for sex, age, position	3	21	1	0	8	48
Hard, unpleasant	1	6	2	2	8	28
Don't like or afraid of animals	2	12			1***	22
Would or wouldn't want company	2	2	1	9	0	20
Makes tired, sore	2	0	2	3	4	16
Location	0	3	1	1	6	15
No fun, not interesting	1	3	1	3	3	14
All other	3	19	4	1	10	56
No Specific Reason Given	21	17	13	16	14	118

* See footnote *, Table 3.

** See footnote **, Table 3.

*** One girl was afraid of the mule.

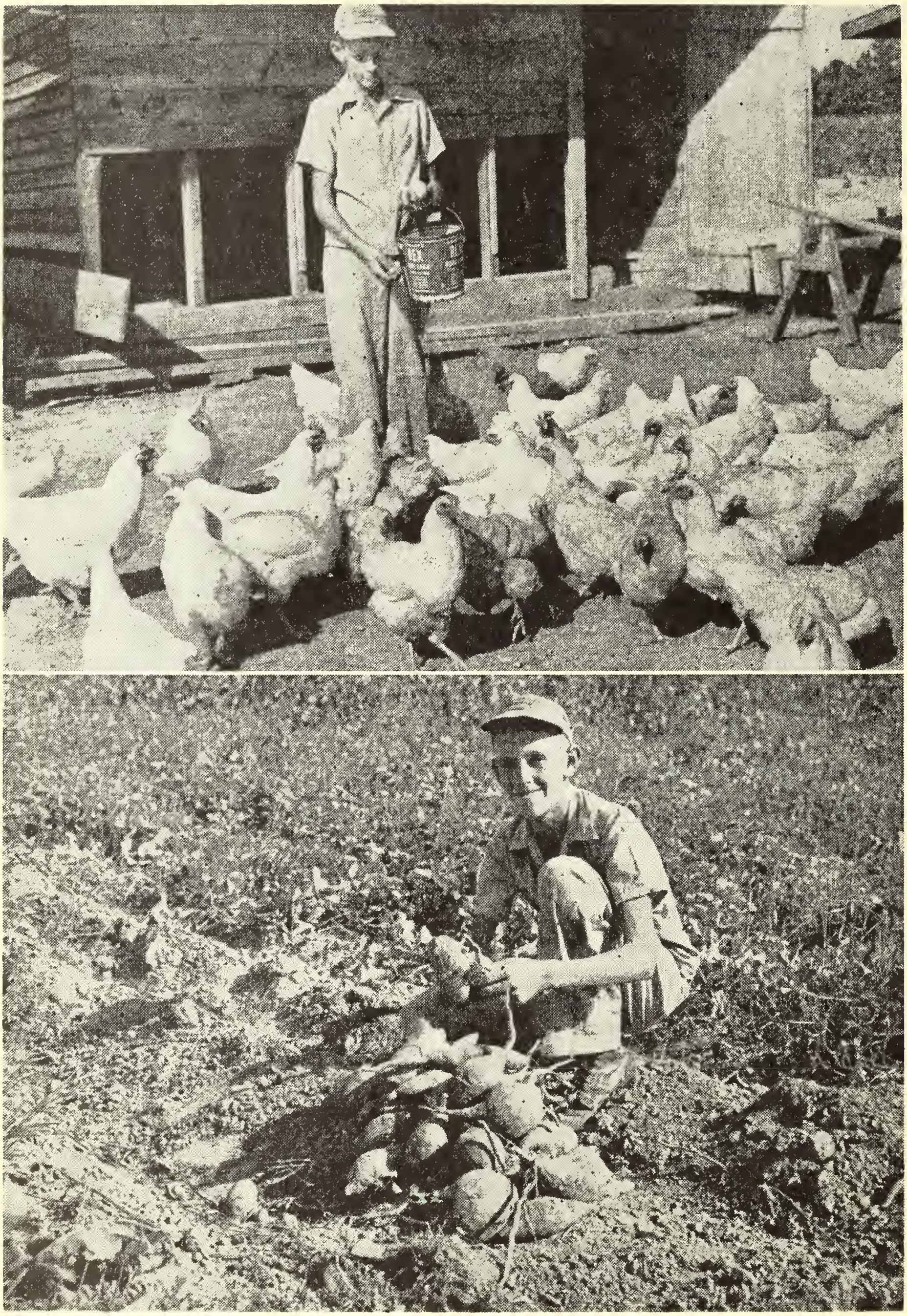
only two opportunities to mention animals, but five opportunities to mention such reasons as helping, duty, food, etc.

Duty was a reason for favoring the task by a number of children in all four groups. Many of these children had a keen feeling of responsibility. They thought it was only fair play to do their part in the family and expressed this idea in many ways.

Money reasons were also given by a number. Sale of the foods pictured would give money to buy those things needed by the boy or girl or his family. Also in this group were money saving reasons. That is, because of these foods, the family would not have to spend as much on the grocery bill and would have more money for other things.

As will be noted, location of the task and other people (their presence or absence—a few girls liked being alone) were given by some children in every group as a reason for favoring. Very few of the boys and girls mentioned appropriateness of task for sex, age, position. But **inappropriateness** of the task for sex, age, position was one of the important reasons given by these children for **not** favoring the activity.

Location; other people; appropriateness for sex, age, position type of reasons for favoring were not as important as either nature-of-task reasons (fun, interesting; easy, pleasant) or personal benefit rea-



Pictures of boy alone feeding chickens and stacking sweet potatoes shown white boys.

sons (help me, chance to learn, build body).

Differences in Pictures. In the two poultry scenes shown boys (the family scene building hen nests, and the boy feeding chickens alone) reasons having to do with liking poultry or wanting to take care of poultry were most often given. Helping was next in importance. In the other three pictures shown to boys relating to potatoes and peas, helping and food reasons were most often given.

Important reasons given by girls for favoring the activity in the two farm animals scenes were helping (parents and others) and wanting to care for or liking farm animals. In the other scenes depicting stacking potatoes and shelling peas the type of reasons most often given were helping and food. In the hog feeding scene, however, the same proportion of Negro girls gave not favoring the activity because they did not like or were afraid of hogs as gave favoring the activity because they wanted to care for or liked hogs. More white girls mentioned liking this animal or wanting to care for them than mentioned not liking or being afraid of them.

Differences in White and Negro Boys and Girls. Reasons of specified types given for favoring the activity which constituted 10 percent or more of the total given were: (See left below) [6]

White boys	Negro boys
Helping	Food
Food	Helping
Farm animals	Money

White girls	Negro girls
Helping	Food
Food	Helping
Farm animals	Money
Duty	
Fun, interesting	

Helping and farm animal reasons were more important with white than with Negro children. But food and money reasons were more important with Negro children. Negro children averaged slightly fewer reasons for favoring per child than white children.

Reasons of specified types given for not favoring the activity which constituted 10 percent or more of the total given were:

White Boys	Negro Boys
No fun, not interesting	Not suitable for sex, age, position
Hard, unpleasant	Hard, unpleasant
Makes sore, tired	No fun, not interesting
Don't like location	Makes sore, tired

White Girls	Negro Girls
Hard, unpleasant	Not suitable for sex, age, position
Not suitable for sex, age, position	Hard, unpleasant
No fun, not interesting	Don't like or afraid of animals
Makes sore, hurts	
Don't like or afraid of animals	
Don't like location	

Nature-of-task reasons (hard, unpleasant; no fun, uninteresting) ranked high in all groups as reasons for not favoring activities pictured. It is important that parents and educators develop means of making tasks more fun and interesting and that they work to minimize undesirable features, allowing play to be combined with work, providing rest periods and the like.

Frequency of Performing and Reasons. Children in this study, as has been shown, were more favorable to activities which they did often. It seemed desirable to investigate this relationship further. Therefore, reasons given for favoring shelling peas and stacking potatoes by boys and girls who did these activities often and who did them seldom or never were compared. A higher percentage of boys who shelled peas and stacked potatoes **often** gave food, money, ownership and accomplishment, helping, and duty reasons for favoring than those who did these activities **seldom or never.** A higher percentage of girls who shelled peas and stacked potatoes **often** gave food, money, helping, duty, and location reasons for favoring than did those who did these activities **seldom or never.**

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[6] Ratings were made by getting total number of reasons given and dividing specified reason by total number, i.e., 180 ÷ 845 - 21 percent helping reasons for white boys.

But a higher percentage of boys who had shelled peas **often** reported that it was a job that made sore or tired (i.e., made fingers sore or tired) than those who had done the activity seldom or never. The percentages reporting they did **not** favor shelling peas because it made sore or tired were:

	Often	Seldom or Never
White boys	16	7
Negro boys	9	3

Only one percent of the white girls and two percent of the Negro girls who shelled peas often gave as a reason for not favoring shelling peas that it made fingers sore and tired.

Boys who shelled peas seldom or never and girls who stacked potatoes seldom or never gave as a reason for not favoring: "inappropriateness of the activity for sex, age, position" more frequently than did the children who did these activities often as is shown by percentage mentioning this reason for not favoring:

Shelling Peas	Often	Seldom or Never
White boys	6	16
Negro boys	11	12
Stacking Potatoes		
White girls	0	6
Negro girls	4	14

Those children who did an activity often were usually in families where the activity was performed often. Many had had the satisfaction that results from a supply of good home-produced food, as well as of doing one's share and helping parents and other people in the family. Children from homes in which the activity is never or rarely performed know little about such satisfactions.

Reasons by Daughters of White Farmers and Non-Farmers. It has already been shown that there was little difference in percentage of children of farmers and non-farmers who favored the activities pictured. The fact that the greatest difference in percentages was with white girls in connection with the activities of feeding hogs and stacking potatoes was pointed out. It seems pertinent here to show important differences in reasons for favoring or not favoring these activities, [7] given by daughters from parental families of these two occupational groups. Percentage of girls giving the reasons were:

Reason	**Feeding Hogs**	
	Farmer	Non-Farmer
For Favoring		
Duty	12	0
Like farm animals	31	21
For not favoring		
Don't like or afraid of animals	17	42

Reason	**Stacking Potatoes**	
	Farmer	Non-Farmer
For Favoring		
Helping	38	4
Food	23	4
For not favoring		
Hard, unpleasant	12	29

As will be noted, relatively more daughters of non-farmers reported

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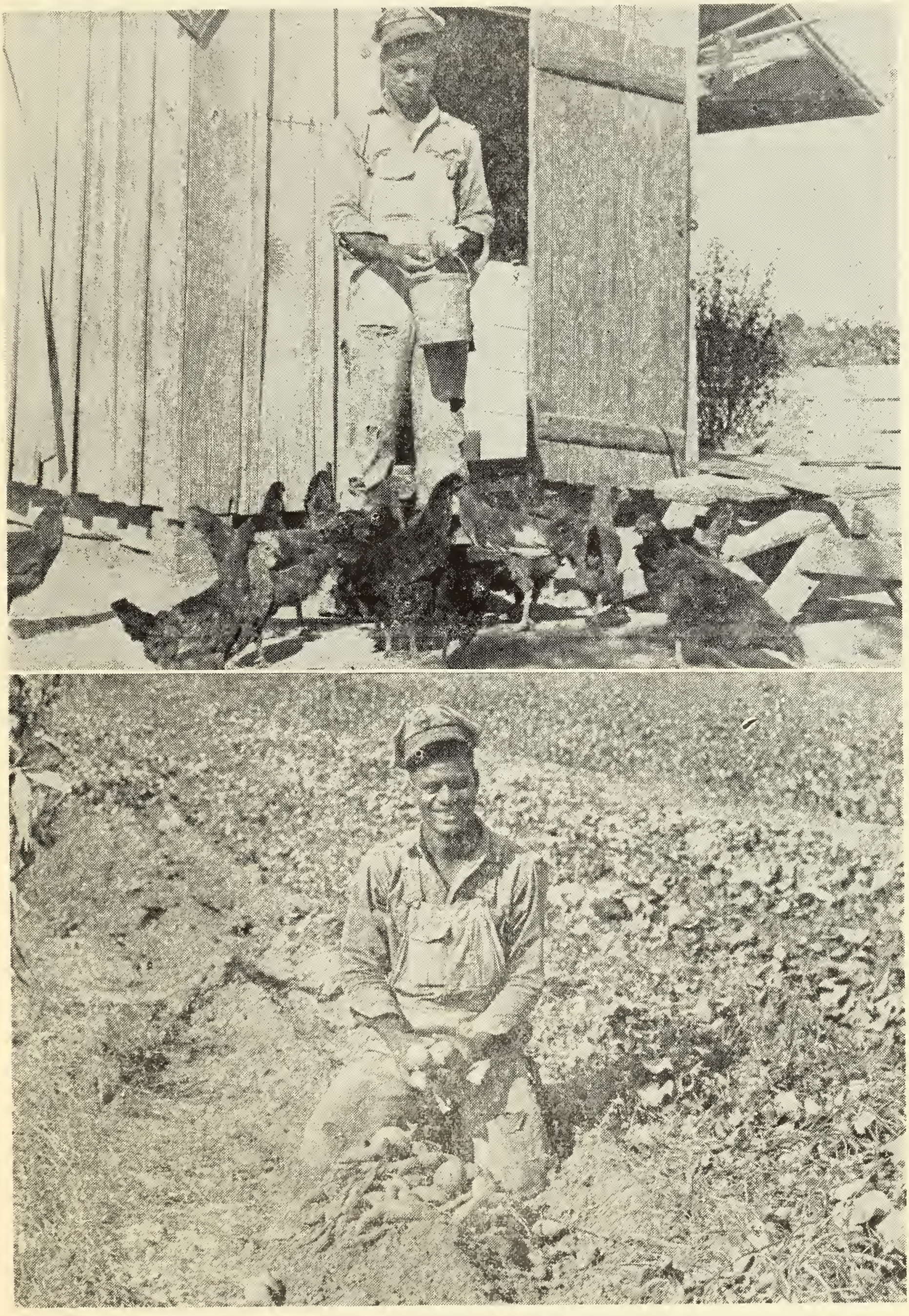
[7] Reasons are limited to those where differences from children of two occupation groups were greatest.



Pictures of boy alone feeding chickens and stacking sweet potatoes shown Negro boys.

disliking the activity pictured because they did not like hogs or were afraid of them. More regarded stacking potatoes as a hard, unpleasant task. Relatively more daughters of farmers liked hogs or enjoyed caring for them. More thought of these activities in terms of food, helping, duty. These attitudes, are, of course, related to greater experience with the activities by farm girls.

4-H Club Membership and Reasons. In a previous section of the report it was shown that there were more differences between 4-H Club members and non-members in percentages favoring when the activity was less liked than when it was well liked. It seemed important to find out why this was so. Therefore, less popular activities were selected for this special analysis — shelling peas for boys and stacking potatoes for girls. The percentage of boys who were 4-H Club and non-Club members who gave the following reasons for favoring and not favoring shelling peas was: [8]

Reasons	White boys 4-H Club Member	Non Member	Negro boys 4-H Club Member	Non Member
For Favoring				
Duty	11	9	10	3
Food	25	17	53	29
For Not Favoring				
No fun, uninteresting	13	25	1	3
Don't like indoor work	2	19	1	3

The percentage of girls who were 4-H Club and non-Club members who gave the following reasons for favoring and not favoring stacking potatoes was: [9]

Reasons	White girls 4-H Club Member	Non Member	Negro Girls 4-H Club Member	Non Member
For Favoring				
Fun, interesting	12	9	1	13
Helping	45	24	27	11
Money	9	3	13	3
Food	30	14	40	28
Likes outside work	9	16	0	0
For not favoring				
Don't like work	3	11	0	13
No fun, not interesting	0	8	0	5
Hard, unpleasant	12	17	1	13
Not used to it; don't know how	0	1	0	8
Inappropriate job for sex, age	3	4	1	8
Forced by parents, ridicule by friend	0	3	0	10
Don't like outdoor work	4	17	0	13

There were big differences in the percentage of 4-H Club members and non-members giving food as a reason for favoring. Club members rarely gave as a reason for not favoring the activity—its location, i.e., don't like indoor work, don't like outdoor work. Also to be noted is the big difference in percentage of Club and non-Club girls favoring the activity because they wanted to help their parents and others. [10]

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[8] Reasons are limited to those in which differences in percentages of 4-H Club members and non-members reporting were greatest.

[9] See footnote [8]

[10] Tables showing reasons given by children in the four groups in all pictures classified by whether or not activity was done frequently or seldom or never and by whether or not child is a member or non-member of 4-H Club may be obtained from Home Economics Department of the Mississippi Agricultural Experiment Station.

Girl alone shelling peas for canning—picture shown Negro girls.

SPECIFIC REASONS FOR ATTITUDES [11]

Food. As has been shown, "Food to eat" was an important reason given by all groups of children for favoring specified production activities. Reasons which had to do with eating **now** were given by relatively more white and Negro boys than reasons that concerned **future** food. Percentages of the total food reasons which concerned "food now" for the four groups were:

White boys	72
Negro boys	78
White girls	62
Negro girls	66

Food **now** seems to be a more important reason for favoring a production activity than food **future.** This is especially the case with Negro children whom even in the canning scene spoke more in terms of eating the peas now. Some comments classified as "food now" reasons included: "Nothing better for breakfast than good fresh eggs"; "You can make good pies out of sweet potatoes or either fried ones"; "Getting a real tasty delicious food"; "I like peas for dinner". Examples of "food future" reasons are: "What a good time he'll have eating them in winter"; "Feels like he won't get hungry in the winter"; "Thinking of the cold winter days when hot peas will taste good”; “If they are going to kill the hogs in the winter time, she’d like to eat the meat”.

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[11] Tables giving percentages of children in each of the 4 groups reporting specified reasons such as food now; food future; helping parents; helping others; like to see animals well cared for; like chickens; hogs—may be obtained from the Home Economics Department of the Mississippi Agricultural Experiment Station.

Few children gave as a reason for feeling unfavorable to the activity not liking the food (only 10 of the reasons given for all 5 pictures concerned not liking the food.) Most children liked the foods which were pictured, as has already been shown.

Helping. Helping people — particularly parents—was an important reason for feeling favorable towards the food production activities pictured. About three-fourths (72 percent) of the helping reasons concerned helping parents. Helping parents was a reason of greater importance to girls (especially Negro girls) than to boys. Seventy percent of the total helping reasons given by Negro boys and 88 percent by Negro girls concerned helping parents. The proportions for white boys and girls were 66 and 70 percent respectively. Relatively more children from all groups mentioned helping parents in the family group pictures than in the scenes of the child alone, though differences were not marked. The percentage of children mentioning helping parents in connection with these pictures were:

	Family scenes			Child alone scenes	
	Poultry scene	Shelling peas	Stacking potatoes	Feeding chickens or hogs	Stacking potatoes or shelling peas
White boys	30	24	24	15	14
Negro boys	17	18	13	10	11
White girls	15	31	20	7	21
Negro girls	11	28	22	9	19

This study shows that helping parents is an important reason for favoring production activities in all groups, whether boy or girl, white or Negro.

Some examples of reasons for favoring because parents were being helped include: ‘Happy because my mother and father won’t have to do that work”; “That much less Daddy would have to do”; “Have helped my mother and father do a small chore that would take up some of their time’; “Doesn’t want her parents to do all the work while she sits down and takes it easy”; “Because they’ve done so much for you”; “Parents are older than I am and sometimes they wouldn’t feel as much like doing these duties as I would”. Some examples of reasons for favoring because of helping others or helping in general are: “Doing something for somebody else”; “Happy because he’s helping”; “He may be helping city people who buy their vegetables”; “Give some to the sick or someone who is not able to buy food”.

Farm animals. There were two types of favorable reasons for liking activities in connection with poultry and hogs, farm animals included in the pictures shown the children. These were: (1) the child liked the animals (or fowl) (2) the child desired to see that the animal (or fowl) was properly cared for. The percentage of these farm animal reasons which were of the first type (child likes the animal (or fowl) in the four group were:

White boys	35
Negro boys	21
White girls	62
Negro girls	52

As will be noted, the "liking the animal" type of reason was relatively much more important with girls and especially white girls than with boys. It was relatively more important with white boys than Negro boys, with white girls than Negro girls.

Some of the reasons given which show that the child likes animals (or fowls) were: "Because I like the animal he's feeding"; "Likes to watch them trying to eat more than the others do"; "Likes chickens around the yard and love them after they are hatched"; "You come to know the way of hogs better"; "Like to fool with little bittie chickens"; "Hogs are very interesting to study about. You notice the way they eat and what they eat"; "They are very pretty, I think (hogs)"; "It's fun for the chickens to run with bread or meat in their mouth and to peck each other".

Some comments made by the children indicating they felt responsible for providing for the animals were: "Would enjoy preparing a place for the chickens to lay. It seems like it will be like fixing a place for a dog"; "I couldn't stand watching them not being comfortable"; "If she didn't feed the hogs, they might starve"; "Chickens like to eat just as much as we do"; "If they would lay on the ground, the dogs might get the eggs"; "If he was a chicken, he would want to be fed"; "Just the thoughts of an animal when he is hungry"; "I feel this way because if I was a hog or animal I would like someone to take care of me"; "Hens like to have a nest with hay like we like to have a bed with cover"; "He feels if they don't clean the nests, the hens will have a disease".

As mentioned, the "like poultry, like hogs" type of reason for favoring was relatively more important with girls than with boys as a reason for favoring the production activity. The dislike poultry, hogs, or afraid of poultry, hogs type of reason for not favoring the production activity was likewise more important with girls than boys. In fact, only seven reasons for not favoring because of disliking animals were given by boys. No boy gave an "afraid of animal" reason. But boys were not shown a picture of a boy feeding hogs, as were girls. All except two "afraid of animal" reasons given by girls involved hogs, not poultry. Two Negro girls, however, said they did not favor the activity of feeding chickens because they were afraid of the chickens. No white girl gave this reason for not favoring feeding chickens. Of those reasons for not favoring the activity because of a dislike or being afraid of animals, 24 percent by white girls and 38 percent by Negro girls were of the latter type.

Some of the reasons given by children showing dislike for animals or being afraid of animals were: "I'm just funny. I don't like no kind of chickens or birds around me"; "In the summer chickens walk on your toes"; "Some hogs will run people. They could chase her and catch her"; "Afraid of some of our chickens when I go to feed them"; "Hogs is a natsy thing".

Duty. "Doing my part, my share" as has been pointed out, was a reason often given for favoring these farm activities. "Not my duty" was a reason much less often given for **not** favoring an activity. It was given in 4 comments by white boys, 6 by Negro boys, 3 by white girls, and 2 by Negro girls in connection with the five pictures. Among duty reasons given (for favoring) were: "His job because he is part of the family and eats under that roof"; "As much her job as anybody else's"; "I'd feel responsible for getting something done"; "It would be my share of the work"; "I'd feel like I was doing my duty because the work has to be done by someone and it might as well be me". Examples of "Not my duty" reasons include: "Wouldn't feel like I was supposed to do that"; "He figures he shouldn't have to help can"; "Not her duty to feed hogs".

Money. Money reasons for favoring the activity were of two types (1) those that involved making money, i.e., selling the food pictured (2) those that involved saving money, i.e., having to buy less because home-produced food was available. Shown below is the percentage of total money reasons that involved "making money". (The remaining involved saving money).

	Percentage
White boys	85
Negro boys	55
White girls	77
Negro girls	49

Negro children see the activity as desirable because it cuts living expenses while white children see it in terms of making money.

Some of the money reasons given of the two types were: "If he didn't spend much money in growing his crop he ought to have a good profit"; "The price of hogs is high and you can make a lot of money on them"; "If it wasn't for the chickens he would have to buy the eggs and eggs cost very much"; "Cut the grocery expense".

That the activity was not profitable was mentioned as a reason for not favoring the activity by only three, all boys.

Nature of Task. As previously indicated, nature-of-task reasons included two groups (1) easy, pleasant (2) fun, interesting.

Reasons for favoring the activity because the task was easy or pleasant were usually given in general terms. The reasons for **not** favoring the activity because the task was hard or unpleasant were more specific. Some examples of reasons for favoring activities because they were considered easy or pleasant are: "An easy job that can be done in a hurry"; "Don't have to do nothing but run along and pick them up and put them in that pile"; "Not a hard job"; "As soon do that as anything else there is to do in the field"; "Feels relaxed".

Reasons for not favoring the activity because it was hard or unpleasant (not easy, not pleasant) included 4 types. These are: (1) hard to do (2) unpleasant, sticky, messy (3) not active enough (4) takes too long; too slow. The percentages of total reasons for **not** favoring because hard or unpleasant classified into the 4 types were as follows:

	White boys	Negro boys	White girls	Negro girls
Hard to do	51	50	43	47
Sticky, messy	19	25	36	38
Not active enough	11	8	5	0
Takes too long	19	17	16	15

As will be noted, more boys than girls described the task as "not active enough", while more girls than boys described the task as "sticky, messy". Most of the unfavorable comments classified in the hard or unpleasant category by boys were in connection with shelling peas and by girls in connection with stacking potatoes and feeding hogs. Some of these were: "Hard labor"; "Hard to get the peas out of the hull"; "Get ole tater wax all over your hands"; "Don't like the dirt under my fingernails"; "Would keep me too quiet and still"; "You just sit there all the time"; "Takes a long time"; "All day long" (in the hot sun); "A slow job".

The fact that the activity was fun or not fun was a reason more often given by boys than girls, while "interesting" features of the activity were more often mentioned by girls. Some of the "fun" comments were: "He can have fun by making a game of it. See who can shell most peas"; "Because I like to dig in the dirt for gathering potatoes in the fall and have on cutouts and the dirt will get into my shoes, and it will be soft"; "It's fun watching them run to every handful you throw on the ground as if it was a different thing"; "Happy because I could run a lot—out in the field—up and down".

Some of the comments favoring an activity because of interesting features were: "Interesting to see the different kinds and shapes of potatoes"; "It's kinda wonderful to cook things"; "Interested in cooking and making different things" (a number of girls mentioned cooking in connection with the canning scene); "I'd get to hammer some and get to nail it up on the side of the hen house, like to work with wood".

Some of the comments not favoring an activity because it was not interesting were: "Plowing is much more interesting than harvesting"; "Had another job he wants to do"; "Likes to do anything else but pick up sweet potatoes"; "I'd rather be at home reading". Some examples of comments not favoring the activity because it was not fun include: "Not enjoying herself like other girls"; "Rather be riding a bike with some of my friends"; "Would want to be out playing with other kids.

Ownership and Accomplishment. As has been shown, pride in ownership -- in quality and quantity of produce and of animals and opportunity for personal accomplishment were given as a reason for favoring the activity by more boys than girls. The ownership reason was relatively more popular with girls; accomplishment, with boys. The percentage of the total ownership, accomplishment reasons which were reasons of ownership were for:

White boys	44
Negro boys	41
White girls	52
Negro girls	54

Some examples of reasons of these types given for favoring are: "Because they are his own"; "The things he is tending might belong to him"; "Feels very proud of his sweet potato crop"; "I like to work in the garden and grow vegetables that I can really call my own"; "Happy knowing I have done something wonderful"; "Sees the progress of his labor"; "Because of the success of my crop"; "I'm creating something if I'm doing it by myself"; "Real proud if she grew them herself".

Three reasons were given for **not** favoring the activity because the produce belonged to someone else. These were: "Don't think this boy wants to pick up potatoes because they may not be his"; "Would hate it if they weren't my peas"; "Wouldn't feel so good if he didn't grow them (peas)".

Personal Benefit. Personal benefit, as has been shown, was often a reason given by the child for favoring the activity. The percentage of total reasons for favoring because of personal benefits which were classified as "Would help me"; "Chance to learn things"; "Makes healthy, builds body" were:

	White boys	Negro boys	White girls	Negro girls
Would help me	32	37	20	33
Chance to learn	45	26	47	27
Make healthy	23	37	33	40

A large percentage of the white children's personal benefit reasons pertained to opportunity which the activity afforded to learning to do.

Some examples of these three types of reasons are: "He knows it will be a help to him"; "It's for his benefit"; "I'd be worth being around"; "Good for a boy to learn to do work of that kind"; "She is training herself"; "Learn how it is so he can do it when his father is not with him"; "Make a better farmer's wife"; "He'll know how to raise sweet potatoes when he gets grown"; "Good for their bodies"; "Good for his fingers"; "Very good exercise."

Important in reasons for not favoring one of these production activities were personal disadvantages (such as makes sore, hurts; makes tired [11].) A good many of these reasons were made in connection with the family scenes of shelling peas and of stacking potatoes. The percentage of children from the four groups giving these two types of reasons for not favoring the two activities were:

	White boys	Negro boys	White girls	Negro girls
Shelling peas				
Makes tired	3	4	1	1
Makes sore, hurts	8	1	3	2
Stacking potatoes				
Makes tired	8	3	6	3
Makes sore, hurts	9	0	9	1

As will be noted, the reason that the activity made sore or hurt was more often given by white children. In fact, there were more differences in race than in sex giving this type of reply.

Some examples of comments of the "Made tired" type of reason are: "I'd be too tired to do anything the next day"; "His back and neck and hands get tired". Some examples of the "Makes sore or hurts" type of reason for not favoring are: "Makes fingers sore"; "I will hurt my finger with the hammer"; "Hurts my back".

Location. Children mentioned like outdoor work or don't like outdoor work in their reasons for favoring or not favoring more than they mentioned liking or disliking indoor work (but there were 3 outdoor pictures for girls, 4 for boys). Total **number** of reasons given by all groups were:

Like outdoors	72
Like indoors	8
Don't like outdoors	49
Don't like indoors	25

More girls, and white girls in particular, talked about liking and not liking outdoor work. Among "location" reasons for favoring were: "I don't mind working in the field"; "Because she might like outdoor jobs". Among those reasons for not favoring location were: "Had rather be outdoors"; "Have never enjoyed things around the house"; "Because she is in the hot sun turning her hair white"; "Hate to be in the house"; "You would bake if it was hot."

Customary Activity. There were two types of reasons for favoring under "customary activity": (1) The activity was favored because it was a regular job. For example, "This is my regular job and I would feel fine"; "Doesn't mind because it's an everyday occurrence". (2) The activity was favored because in the opinion of the respondent who had considerable experience, he could do it right. For example, "I know how to do that work".

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[11] Several reasons for not favoring about the activity being uncomfortable and one that the boy would get hungry working in the field were also classified in this category.

The first type (used to it—regular job) was more often given as a reason for favoring than was the second type. Many of **the** the second type of reasons were classified as picture reasons. See appendix.

On the other hand, there were a few children who did not favor the activity because they were **too** used to it. Some of these reasons for not favoring were: "Feels bad because he's been used to doing that all the time"; "Wouldn't feel happy because I have to help feed four thousand (chickens) every morning and night".

Other People. The pictures of the family group brought forth both favorable and unfavorable comments concerning companionship and help in doing the task. The pictures of the child alone brought forth comments from a few girls about liking to work alone. These comments were made in connection with the picture of the girl shelling peas alone. Here the girl was seated doing a routine job where there was opportunity for daydreaming. A few girls gave presence of other people in the family group pictures as a reason for not favoring. The percentage of the "other people" replies of the different types were:

	White boys	Negro boys	White girls	Negro girls
Reasons for favoring				
Have help	14	67	26	58
Companionship, other people around	86	33	52	27
Likes being alone	0	0	22	15
Reasons for not favoring				
Would want help	0	22	40	48
Would want company	—*	78	27	41
Don't want others around	0	0	33	11

*One boy gave a reason for not favoring in a picture of the boy alone.

Some examples of the companionship, help, and solitude reasons given by children for favoring the activity were: "Anyone is happy when they can have a nice family to work with"; "Enjoys seeing **her** brother work, too"; "Would feel that someone cared for me and didn't want me to do it by myself"; "I don't imagine she minds it with the whole family working together"; "Don't like to be worried with anyone else who is dropping them" (the peas); "Likes because she can have her mind on something else" (while shelling peas.)

Examples of companionship, help, and solitude reasons for **not** favoring the activity included: "Her family is getting on her nerves"; "Because her mother, father, and brother is in the kitchen and she doesn't want to be disturbed"; "My parents would be observing and I would get upset and nervous"; "I could do more with just myself in the kitchen than with three more in there"; "You'll start talking and not do as much"; "Sad because I get awful lonesome when I'm doing something by myself"; "Would feel afraid because I am by myself"; "Because I'd be the only boy picking up potatoes"; "Wouldn't mind if someone was helping her".

Appropriate for Sex, Age, Position. Appropriateness of task for sex and for age and position was mentioned more by Negro boys

(11 reasons pertaining to sex and 11 pertaining to age and position were given in connection with the 5 pictures) than any other group. Children in other groups rarely gave this as a reason for favoring an activity. An important factor to account for this difference, was, without doubt, the fact that Negro boys in the sample were older than the other children.

That the task was **not** appropriate for the sex, age, or position of the child was often mentioned, as has already been shown. Some illustrations of such reasons are: "Her little brother could do it instead of her" (feeding chickens): "Shelling peas is a girl's job"; "I don't imagine he feels so good about it unless he's a sissy"; "The boy and his father should care for the hogs, horses, and cattle"; "A girl her age probably doesn't like it"; "Thinks he's old enough not to do the work of girls"; "He thinks his father should be picking up sweet potatoes".

All Other

Some other types of reasons for favoring given by one or more children not previously discussed include: Likes work; likes farm life and anything associated with it; it's a 4-H Club project; something different; approval of others; pleasant supervision from parents; care of produce; strong or healthy enough to do. Some examples of these reasons are: "Likes job because he's a working boy"; "He may even like any work that is put before him"; "Likes to do farm work because I am a farm girl and all farm girls be happy"; "She will have some peas to put on exhibit raising them as a project in the 4-H Club"; "Would know that I am a good 4-H Club member"; "Raising them (hogs) for a prize"; "Enjoying it because it is her first time to do it"; "Because she may not do this type of work often"; "Would like to see something that I have done to make the family proud of me"; "Would like to show other boys what you can do if you try"; "Feel fine because the people will see me building hen nests"; "There was never rude words from her mother or father about the home duties"; "If I'm not made to do it, I like picking them up"; "Doing my homework without being told every time the work was done"; "Get the potatoes into a shelter where they won't ruin"; "It would be a waste not to can them"; "Happy that she is healthy enough"; "Nice that she has the strength and health to do it with".

Some other types of reasons for **not** favoring given by one or more children not previously discussed include: dislikes work; don't like farming; not used to it; don't know how; wouldn't want friends to see; don't like surroundings or equipment; personal appearance; made to do it or having to do more than share of work; not healthy enough to do it; activity not profitable. Some examples of reasons of these kinds are: "Don't like work"; "Maybe I'm just lazy, I guess"; "Every boy I've seen yet just don't like to work too much"; "Don't like farming very much"; "Don't like a garden of no kind"; "Wouldn't like it because had never did it"; "Wouldn't be used to it"; "Don't like because cannot shell good"; "Because he don't want his friends, boys or girls, to see him feeding chickens"; "Because it stinks (hog pen)"; "Maybe he cannot dress as he wishes to"; "I would want to go someplace with a friend which have long fingernails and I would want to have long fingernails, too";

"She'll have to get those pea stains off her fingers before she can go somewhere"; "It might make her hands rough and she doesn't want that"; "Looks like it is a job, someone made her do"; "If he didn't get them all his Dad might whip him"; "Because her mother is scolding her"; "Feel like I had to do everything to be done at all times"; "Seems nothing can be done without her help"; "Her back may not be strong"; "Don't like farm work because I won't have any money to buy clothes"; "Would want something to bring me more profit" (than chickens.)

SUMMARY AND CONCLUSIONS

This is a report of a study of attitudes of children toward food production and processing activities. The method of determining children's attitudes used in this study was having the children answer four questions concerning each of five pictures depicting scenes in which children were carrying on food production and canning activities, either alone or in a family group. These questions were: (1) How do you think this boy (girl) gathering sweet potatoes (shelling peas, feeding chickens, etc.) feels about doing this? (2) Why do you think he (she) feels this way? (3) How would you feel if you were the boy (girl) in the picture? (4) Why would you feel this way?

Fourteen photographs (7 of white children and their families and an exact duplicate of Negro children and their families) were used. These 7 photographs included three family food production scenes as well as two with boys and two with girls working at production tasks alone.

The study was made in Quitman and Tate Counties, Mississippi. It included 400 children in the seventh, eighth, and ninth grades and 114 children retarded in school (i.e., children 13-16 years in 6th grade or under.)

The child's general attitude toward the production activity was obtained from an analysis of his replies to questions concerning how he would feel if he were the child in the picture and why he would feel this way (questions 3 and 4). If all or the majority of his comments were favorable to the activity, then his attitude was classified as favorable. If all or the majority of comments were unfavorable to the activity, then his attitude was so classified.

It was inevitable that some children would pick up cues from the photographs (e.g., facial expressions) which would be reflected in their answers to the first two questions about how the boy or girl in the picture felt. These "picture influences", however, did not seem to affect the response to the third and fourth questions which attempted to get at the child's own attitudes toward the activity. Evidence for this assumption lies in the fact that for each picture many children showed an attitude-shift from question (1) to question (3). The fact that question (3) responses were thus "independent" of question (1) responses leads us to accept the former as valid measures of the children's attitudes toward these activities.

Attitudes of the majortiy of white and Negro boys and girls towards each of the activities pictured were favorable (except white boys toward shelling peas and Negro girls towards feeding hogs.) Attitudes of boys were most favorable toward the two poultry activities and least favorable toward shelling peas in the group situation. Attitudes of girls were most favorable toward feeding chickens and least favorable toward feeding hogs. But many girls were not favorable to the activity of stacking potatoes. Attitudes of very few children (boys, girls, white, Negro) were classified as neutral on any of these activities.

Greatest differences in attitudes of children were related to familiarity with the activity and to 4-H Club membership. Children who had done the activity "often" were more favorable to it than those who had done it "seldom" or "never". There was little difference in attitudes of 4-H Club members and non-members for the more popular activities but 4-H Club members were considerably more favorable to less popular activities than were non-members.

Responses to questions (2) and (4) were analyzed in an attempt to uncover the reasons behind favorable and unfavorable attitudes. Two types of reasons were excluded from this analysis: (1) All reasons given in reply to question (2) in those instances in which the respondent shifted attitudes between question (1) and question (3); and (2) All "picture reasons" (i.e., reasons directly traceable to elements of the photographs and thus of little relevance to the child's own attitudes toward the activity.)

The leading types of reasons for favoring the activity were "food reasons" and "helping reasons" (i.e., the good food resulting for use now or in the future and the opportunity provided for helping parents and others.) Desire to care for animals (fowls) or liking the animal was, however, an important reason in all groups for favoring activities involving farm animals. "Nature-of-task reasons" (hard, unpleasant; no fun, uninteresting) ranked high in all groups as a kind of reason for not favoring the activity. "Not suitable for sex, age, position" was a type of reason of greater importance for not favoring the activity with Negro than with white children.

A higher proportion of boys and girls who had performed the activity "often" gave food, money, helping, and duty types of reasons than did those who performed it "seldom or never".

When asked about the less popular activity, shelling peas, more 4-H Club boys than non-members gave reasons of the "food" and "duty" types for favoring the activity and fewer of the "no fun, uninteresting" and "dislike-indoors" type of reasons for not favoring it. When girls were asked about the less popular task, stacking sweet potatoes — more 4-H Club members than non-members gave reasons of the "food" and "helping" types for favoring and fewer of the "hard, unpleasant, and dislike-outdoor" type reasons for not favoring the activity.

This study shows that food habits and attitudes toward food production activities are closely related. When one likes a food, one is more likely to have favorable attitudes toward working to produce it. There is no greater incentive to production than the good food resulting. Another incentive, and about as important, is the belief that one is needed — that one is helpful; helpful to one's parents, to one's associates, to others.

This study points to the importance of parents and educators seeking ways and means of providing fun and interest in connection with these production activities. It also points to the need for minimizing as much as possible hard and unpleasant features in such activities. This study shows the importance of rural boys and girls being given opportunities for performing tasks to which they are unaccustomed, those involving the learning of new skills as well as those ordinarily considered suitable for children of their particular age and sex. It shows the role of the 4-H Club in generating more favorable attitudes for less popular production activities.

It would seem that the picture technique as used in this study served as a good tool for making the child feel at ease and getting him to express his attitudes toward the food production activities about which he was questioned.

APPENDIXES

Appendix A

METHODOLOGY

The major methodological problem in this study was ascertaining children's attitudes toward a number of food-producing and food conserving activities. A wide variety of techniques are available for assessing attitudes. These range from the checking of scale items to the content analysis of extended "focused interviews". Most of these techniques have advantages and disadvantages which are a function of (1) the population under study (2) the subject matter of the investigation, and (3) specific budget and personnel limitations of the research team. In other words, the selection of a particular technique depends largely on the circumstances of the study.

The characteristics of this investigation which seemed to be relevant to the selection of a particular technique included the following:

1. Since both white and Negro interviewers would be required, the method should be simple and standardized enough to permit its use by more than one researcher without extensive training of interviewers.

2. Because the test population was composed in large part of rural children who are not in the habit of extensive verbalization of feelings with adults, the interview situation should be such as to **maximize** the child's interest in the object of study and **facilitate** (if not encourage) verbalization of feelings.

3. Since it was quite likely that the researchers might be perceived as individuals whose status and role "required" or "made expedient" certain stereotyped favorable responses on the part of the children, the technique should be **indirect** enough to permit the child to reveal his feelings with a minimum of influence from the immediate situation. In other words, it would be nice if we could get the child to talk about himself and his feelings "once removed", so to

speak. Projective techniques — those in which the subject unconsciously reveals personality factors in his responses to an external stimulus — have this characteristic of enabling the subject to respond to an indirect approach when a direct or frontal approach might inhibit a response.

It was felt that a "semi-projective" technique using pictures as the external stimulus would best meet the special characteristics of this investigation. We have termed this technique "semi-projective" since it seems to fall somewhere in between the direct approach and the indirect techniques of the projective tests such as the Rohrschack and T. A. T.

Actually, in the present study, the use of the picture method seems to have served four purposes: (1) it standardized the stimulus to the extent that there is comparability of findings as between sex, age, and racial groups; (2) it had a strong enough "attraction" for the children to heighten their interest in the test procedure —they got so interested in the pictures they apparently felt at ease about responding to questions (3) it led **gradually** and indirectly to the child's verbalization of his own feelings **after** he had already performed the relatively "safe" task of telling about the feelings of the child in the picture; (4) it sometimes served as a projective technique in those cases in which the child was expansive in his response to questions about the child in the pictures but reticent about expressing his own feelings.

The Sample: This is a sample from a population of white and Negro children aged 12-20 years enrolled in the ninth grade and under in schools of two rural counties of Mississippi. The easiest way to sample this population was to take 7—8—9 grade children, but this procedure would have missed a number of children, especially Negro children who because they attend school irregularly are retarded in grade. Therefore, a sample of these children in lower grades was taken.

Pretesting: Two kinds of directions were tried out with the pictures in one rural school for white children. A total of 32 children (16 in the fifth grade, 16 in the eighth grade—8 boys and 8 girls each randomly selected) were included in these tests. On some of the pictures the child was instructed: "Now tell me a story about this picture. Tell me what the boy (girl) in the picture is feeling and thinking. You can make up any kind of story you please." On other pictures, he was given more specific directions. These included, "Now tell me a story about the picture of the boy (girl) helping the family raise or get his food. Tell what the boy (girl) is feeling and thinking about while doing this job. You can make up any kind of story you please about the boy (girl) helping at home with the food supply."

Half the children (eight from each grade) were asked to tell the investigator about the boy (girl) in five of the pictures. The other children were asked to write their stories about the boy (girl). The children who wrote their stories were taken together, one grade at a time, but each worked separately with a set of pictures and forms for writing the stories. The children who told their stories were interviewed alone with the investigator. The order in which the children were asked to tell or write about the different pictures was varied from child to child.

The conclusions drawn from this first pretest were (1) that the more specific directions seemed to bring forth better response (2) that a number of the children merely told what the boy (girl) in the picture was doing (3) that the teen-age children seemed to have the vocabulary to write down what they wanted to; but that most fifth grade children did not. On the basis of the findings from the first pretest, the directions to be given the children with the picture were made more specific. For example, in the first picture, boys would be asked (1) How do you think this boy gathering up sweet potatoes feels about doing this? Why do you think he feels this way? (2) How would you feel if you were the boy in the picture? Why would you feel this way? (3) Have you ever done what the boy in the picture is doing? In the third picture, for example, girls would be asked (1) How do you think this girl shelling peas feels about doing this? Why do you think she feels that way? (2) How would you feel if you were the girl in the picture? Why would you feel this way? (3) Have you ever done what the girl in the picture is doing?

Another change after the first pretest was limiting the study to seventh, eighth, and ninth grade children except for a sample of children retarded in grade at school (children 13-16 years of age in sixth grade and under. In this way the sample contained only teen-aged children except for a few advanced in grade for age and several individuals who were twenty years of age in these grades. A classification sheet was also developed at this time, to be filled in by the child or interviewer.

A second pretest was made in two schools, one for white and one for Negro children, using the revised techniques. Twenty-four children in each of these schools were included. Six boys and six girls in each school wrote their replies and the remainder gave them orally. [12] Tests were given, in addition, to a sample of twelve children retarded in grade in each of these schools. Negro women (a teacher and senior girl student) conducted the tests in the school for Negro children. These Negro women were trained by one of the investigators who herself gave the tests in the school for white children.

The revised directions yielded excellent results as will be noted from two typical replies. A Negro boy wrote about picture (1), the picture with the family harvesting sweet potatoes. "I think he feels all right picking up sweet potatoes because he is getting something to eat. He feels all right because he can help his father get through. I would feel good because I would be gathering something to eat. Because I would be getting something to eat for winter. Yes, I have gathered potatoes." A white girl wrote about picture (7), the picture of the girl tending hogs: "I don't think this girl is enjoying this because it is more of a man's job and not a girl's job. Well, I guess she feels that way because she knows it is a man's job and not hers. I wouldn't feel good because it is a man's job and boys', too, and I don't like hogs. I am afraid of them. I have never done what the girl in this picture is doing."

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[12] There were only 11 girls and 8 boys in the Negro school in the 7-8-9 grades and so the Negro sample fell below the 24 planned.

It was thought that there might be more favorable reaction to the production and processing tasks by children when the child gave an oral report. (One tends to be agreeable in a face-to-face contact.) But differences by the two methods were not statistically significant. It was therefore decided to use the writing method for the children in the 7-8-9 grades and the oral method for the children retarded in grade. The writing method has several advantages. The first and most important was speed. The children, it was found, were very interested in this study and undoubtedly discussed the pictures with their school friends. Then too, most schools are crowded without a room that can be used for continuous interviews. Furthermore, the oral method would have been considerably more expensive.

APPENDIX B

Differences in General Attitudes of Children for Child in Picture and for Themselves

Table 7 shows that most children gave the same response in the majority of pictures (or in 3, 4, or 5) for the boy or girl in the picture as for themselves. But the difference in percentage of Negro boys agreeing on both was significantly different from that of white boys and girls and of Negro girls. (76 percent as compared with 95, 92, and 87.)

Table 7. Percentage distribution of white and Negro boys and girls by number of pictures on which there was agreement between attitudes for the boy (girl) in the picture and for themselves.

	Percentage distribution			
Number of pictures	White boys	Negro boys	White girls	Negro girls
5 pictures or all	51	40	38	43
4 pictures	25	23	34	27
3 pictures	19	13	20	17
2 pictures	3	13	6	7
1 picture	1	11	2	3
No picture	1	0	0	3
No. children	119	141	109	145

Table 8. A comparison of percentage distribution of agreement and non-agreement in type of attitudes toward activities for boy (girl) in picture and for self—all pictures.

Agreement of attitudes for	Percentage distribution			
boy (girl) in picture and self	White boys	Negro boys	White girls	Negro girls
1. Both favorable	72	61	63	57
2. Both unfavorable	12	12	17	21
3. Picture favorable, child unfavorable	7	4	11	3
4. Picture unfavorable, child favorable	3	19	3	16
5. Neutral combination	6	4	6	3
Total pictures	595	705	545	725

Negro children were more favorable to the activities for themselves, less often felt the boy or girl in the picture was favorable to the activity. White children, on the other hand, more often thought the boy (girl) in the picture was favorable than they themselves were favorable to the activity (Table 8). Thinking the boy in the picture disliked the activity but liking it for oneself was more common for Negro boys, however, than Negro girls. Pictures responsible for these differences are shown in Table 9 and 10.

Table 9. Percentage white and Negro boys with favorable attitudes toward specified food production activities for the boy in the picture and for themselves.*

Activity and race	Percentage of boys favoring Boy in picture	For self	Percent shift
Building hen nests (family group)			
White boys	97	92	-5
Negro boys	71	91	+20
Feeding chickens (alone)			
White boys	95	95	0
Negro boys	63	85	+22
Shelling peas (group)			
White boys	58	51	-7
Negro boys	56	72	+16
Stacking sweet potatoes (alone)			
White boys	96 (smiling)	83	-13
Negro boys	96 (Smiling)	82	+9
Stacking sweet potatoes (family group)			
White boys	78	68	-10
Negro boys	60	81	+21
All pictures			
White boys	85	76	-9
Negro boys	68	80	+12

* Percentage favoring based on sum of number of favorable and unfavorable.

Table 10. Percentage of white and Negro girls with favorable attitudes toward specified food production activities for the girl in picture and for themselves.*

Activity and race	Percentage of girls favoring Girl in picture	For self	Percent shift
Feeding chickens (family group)			
White girls	96	90	— 6
Negro girls	72	92	+20
Feeding hogs (alone)			
White girls	60	57	— 3
Negro girls	43	47	+4
Shelling peas (group)			
White girls	83	75	— 8
Negro girls	79	87	+8
Shelling peas (alone)			
White girls	83	68	—15
Negro girls	57	77	+20
Stacking sweet potatoes (family group)			
White girls	71	63	— 8
Negro girls	54	69	+15
All pictures			
White girls	79	70	— 9
Negro girls	61	74	+13

*Percentage favoring based on sum of number of favorable and unfavorable.

Tables 9 and 10 show that the child can shift when asked how he would feel if he were the boy (girl) in the picture and express an independent judgment. In other words, the technique used in this study might be described as only semi-projective. The picture, it would seem, serves primarily as a tool for making the child feel at ease and getting him to talking.

APPENDIX C

Picture Reasons

In previous studies using the picture technique investigators have usually asked the subject to tell a story about the picture. From a content analysis of these stories the investigators then attributed various attitudes or attitude syndromes (patterns) to individuals or groups. The assumption in such a technique is that the story elements may be taken as indicative of characteristics of the respondent. To the extent that the test situation is a projective one such an assumption, of course, is probably justified. In some instances, however, where the stimulus is sharply defined and well-structured (as it often is in an ordinary photograph) the assumption that **all** responses reflect the subject's attitudes may not be warranted. In such situations many of these responses may be merely logical derivations from clear-cut cues in the picture and they may have very little relevance to the respondent's feelings. It seems necessary, then, to differentiate between responses which are clearly a function of the stimulus (and as such cannot be expected to vary from one person to another) and those which are a resultant of predispositions characterizing the individual subject. It was for this reason that in the present study a distinction was made between "picture reasons" and "other" reasons for favoring or not favoring various activities. An examination of the extent and nature of such "picture reasons" in the present study may give the reader a better idea of the importance of controlling their possible effects in other investigations using this technique.

A little more than one-half of the children in every group gave one or more picture reasons. [13/] Average number of picture reasons per child was about the same in every group. In other words, results by this method did not differ with white and Negro children. Practically all picture reasons were given in connection with the question: Why do you think **he** feels this way? Very few children gave these reasons in connection with the question about why you would feel this way if you were the boy (girl) in the picture (only 6 percent of the white boys, 10 percent of the Negro boys, 7 percent of the white girls, and 8 percent of the Negro girls.)

Tables 11 and 12 show the types of picture reasons for favoring and not favoring activities in each of the five pictures by white and Negro boys and white and Negro girls. As will be noted, the most important picture reason given by the children in every group, both for favoring or not favoring was the facial expression of the boy or girl in the picture. A higher proportion of white children said the boy (girl) in the picture looked pleased, looked happy than said the boy (girl) in the picture looked unhappy, unpleasant. The reverse was the case with Negro children.

This further substantiates our hypothesis that the child can shift in attitudes between question 1 and 3. Even though the Negro child

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[13/] 57 percent of the white boys, 54 percent of the Negro boys, 63 percent of the white girls, and 58 percent of the Negro girls.

thought the boy in the picture looked sad, unhappy about the activity, he could express for himself favor toward the activity. Even though the white child thought the boy in the picture looked happy about the activity, he could express for himself disfavor toward the activity.

Some of the facial expression comments given were: "He looks like he is having fun in what he is doing because of the smile on his face"; "I think he is happy about doing it because he looks happy"; "He likes doing it because he's grinning"; "He looks like he dislikes the work and seems very disinterested"; "By his looks he does not like what he is doing because he has a frown on his face".

Table 11 shows the effect that smiling of the boy in the picture stacking potatoes alone has on the percentage giving favorable facial expression reasons. The effect seems especially marked for Negro boys, a small proportion of whom gave facial expression reasons for favoring in the other four pictures (9, 5, 6, and 4 percent respectively). In this picture 29 percent gave facial expression reasons for favoring the activity.

One important type of picture reason given for favoring (not mentioned for **not** favoring) was the produce and animals. Examples of this type of reason are: "He's a pretty good farmer if he can raise taters like that"; "I think she feels this way by the way the pig is around her"; "Because he is showing off what large potatoes he has gathered"; "I think the boy feels very good about the chickens because he has all those chickens".

Physical position or posture of the child was another type of picture reason given for favoring as well as not favoring. Some of the comments classified in this category were: "Well, he looks like he'd feel relaxed sitting down like that"; "I don't think she minds doing it because she is sitting and using only her hands"; "She acts as if she is scared to hold out her hand to scatter the grain about".

Picture reasons concerning job or method of work were also given by a number of children. Some of these were: "He looks from the way he is going about his job like he likes it"; "The way he is shelling them I would say he didn't like to do it"; "She likes doing it because of the way she is working; she is not slinging everything around".

Several children — more Negro children than white children—gave picture reasons involving photography or the camera. Some of these were: "Would feel fine to be on the picture"; "Would feel afraid because I haven't never been in a picture"; "Feel good just knowing I was in the picture"; "I would like to be in the picture because I like to shell peas".

Other picture reasons included: other people; sun, dirt; equipment; clothes and personal appearance. Some examples of comments classified in these four types were: "It looks like the whole family is concerned about what goes on in the kitchen"; "Her mother looks tired"; "She looks like she is having fun with her family"; "I think she feels good because she is standing close to her mother"; "She may not like the sun"; "She'll enjoy it; it's a bright sunshiny day"; "I wouldn't want to be the boy in the picture —the sun looks hot"; "The sun looks hot and there is no wind blowing"; "I would feel good because his home has been modernized"; "I don't want to be carrying a can to feed the hogs"; "She is hot because the stove is probably on"; "Feels glad to be as neat, clean, and nice as she is looking"; "The girl is happy because she looks very nice in the kitchen by herself"; "She'll tear that striped skirt getting corn from the barn".

Table 11. Picture reasons given for favoring and not favoring specified food production activities by the 119 white boys and 141 Negro girls.

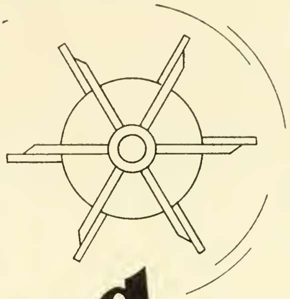
Reasons	PRODUCTION AND CANNING ACTIVITIES					
	Building hen nests (family)	Feeding chickens (alone)	Shelling peas (family)	Stacking sweet potatoes (alone)	Stacking sweet potatoes (family)	Total No. of reasons
White Boys	Percent	Percent	Percent	Percent	Percent	
For Favoring:						
Facial expression	17	17	7	27	10	92
Produce, animals	1	6	0	8	2	20
Job-Method of work, etc.	2	3	3	3	4	17
Physical position, posture	1	1	2	2	3	9
Other people in picture	1	0	3	0	3	7
Sun, dirt, etc.	0	0	0	1	1	2
Photography	0	1	0	0	1	2
Equipment	0	1	0	0	0	1
For NOT Favoring:						
Facial expression	0	3	10	0	2	18
Physical position	0	0	2	0	3	5
Job-Method of work, etc.	0	0	3	0	1	4
Sunshine, dirt	0	1	0	0	2	3
Other people in picture	0	0	0	0	1	1
Negro Boys						
For Favoring:						
Facial expression	5	5	6	29	4	69
Produce, animals	0	2	1	4	1	11
Photography	1	2	1	1	1	9
Physical position, posture	0	1	1	1	0	5
Job-Method of work, etc.	0	0	0	1	1	2
Sun, dirt, etc.	0	0	0	1	0	1
Equipment	0	0	1	0	0	1
For NOT Favoring:						
Facial expression	13	17	16	0	13	83
Physical position	1	0	0	0	7	12
Job-Method of work	1	2	1	0	4	11
Photography	1	0	2	1	0	7
Equipment	0	0	1	0	1	2
Sunshine, dirt	0	0	0	0	1	1
Other people in picture	0	0	0	0	1	1

Table 12. Picture reasons given for favoring and not favoring specified food production activities by the 100 white girls and 145 Negro girls.

	PRODUCTION AND CANNING ACTIVITIES					
Reasons	Feeding chickens (family)	Feeding hogs (alone)	Shelling peas (family)	Shelling peas (alone)	Stacking sweet potatoes (family)	Total No. of reasons
White Girls	Percent	Percent	Percent	Percent	Percent	
For Favoring:						
Facial expression	20	18	13	27	17	104
Physical position, posture	1	1	4	3	0	9
Job-Method of work, etc.	3	1	3	1	1	9
Other people in picture	2	0	4	1	1	9
Sun, dirt, etc.	1	0	0	0	4	5
Produce, animals	1	1	0	0	0	2
Clothes	0	0	1	0	0	1
For NOT Favoring:						
Facial expression	1	9	4	6	8	31
Equipment, surroundings	0	6	2	1	1	11
Physical position	1	2	1	3	2	9
Job-Method of work, etc.	0	1	1	1	0	3
Clothes	0	1	0	1	1	3
Sunshine, dirt	0	0	0	0	1	1
Negro Girls						
For Favoring:						
Facial expression	11	7	13	8	3	62
Physical position, posture	1	1	1	2	0	8
Job-Method of work, etc.	1	1	1	0	3	8
Other people in picture	2	0	1	0	1	6
Produce, animals	3	1	0	0	0	6
Equipment, surroundings	0	1	1	3	0	6
Clothes	1	0	1	1	0	4
Sunshine, dirt	1	0	0	0	1	2
For NOT Favoring						
Facial expression	13	14	8	17	11	91
Physical position	3	2	0	1	4	15
Job-Method of work	1	1	0	0	4	9
Equipment, surroundings	0	3	1	2	0	9
Photography, camera, etc.	0	1	1	0	0	3
Clothes	0	0	0	0	1	2
Other people in picture	0	0	1	0	0	1

BULLETIN 520 MAY 1954

no. 520



Seed Processing Equipment

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Seed Processing Equipment

By G. BURNS WELCH[1]

New and superior crop varieties make their intended contributions to agriculture only when the seed stocks of such crops reach the farmer varietally pure, in a viable condition, free of noxious weeds, in adequate quantities and at a reasonable price.

Seed producers are dependent on commercial processors for separating, cleaning grading, delinting, and treating seed they grow. The quality of the final product, regardless of its inherent capacity to produce, is in direct proportion to the processors' ability to remove inert material, weeds and other crop seeds, and to prevent mechanical mixtures of other indistinguishable varieties. The ability of the processor to render these services is affected by the availability of the proper combination of cleaning and separating equipment, the design or arrangement of the processing plant, and the know-how and skill of the operator.

Through the cooperative efforts of the Mississippi Agricultural Experiment Station, the United States Department of Agriculture, and State and Regional Seedsmen Associations, a comprehensive seed research and training program was initiated at Mississippi State College in 1948 and 1950. The resulting facility, known as the Regional Seed Research Laboratory, is the most completely equipped seed processing laboratory in the world.

The information contained in this Handbook for Seed Processors is offered as a guide to the better processing of Southern seeds.

How Are Seed Separated?

Seed of different varieties are separated by taking advantage of one or more of the differences in their physical characteristics. The following methods are now being used in separating seed:

Size: Seed differing in thickness and width are separated with an air and screen machine, width grader, etc.

Length: Seed differing in length are separated with indented disc and cylinder separators.

Weight: Seed differing in weight are separated with a gravity table.

Surface texture: Rough-surfaced seed are separated from smooth surfaced seed with fabric covered rolls, inclined moving belts, etc.

Degree of roundness: Flat seed are separated from round seed with a spiral gravity separator.

Color: Seed differing in color are separated with the electric eye. (This method is limited to large seed and under special conditions).

In addition to these methods, there is the sawdust method of removing buckhorn, magnetic method of removing dodder, and others.

The machines most commonly used in processing plants are the air and screen machines, indented disc and cylinder length separators, gravity tables, gravity spiral separators, and the roll mills.

Air and Screen Machines

The air and screen machine is considered the basic equipment in most processing plants. Practically all seed are first processed with this machine. It makes use of three cleaning elements; aspiration, scalping, and grading screens or lower screens. The size of this machine varies from the small two-screen farm model

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[1] The author acknowledges the assistance of Dr. Louis N. Wise, in charge, Regional Seed Research Laboratory; H. D. Bunch, assistant agronomist; O. W. Easley, Jr., formerly associate agricultural engineer, Mississippi Agricultural Experiment Station; D. S. Doby, acting chairman, State College Research and Educational Committee, Mississippi Seedsmen's Association; and the principal manufacturers of seed processing and handling equipment.

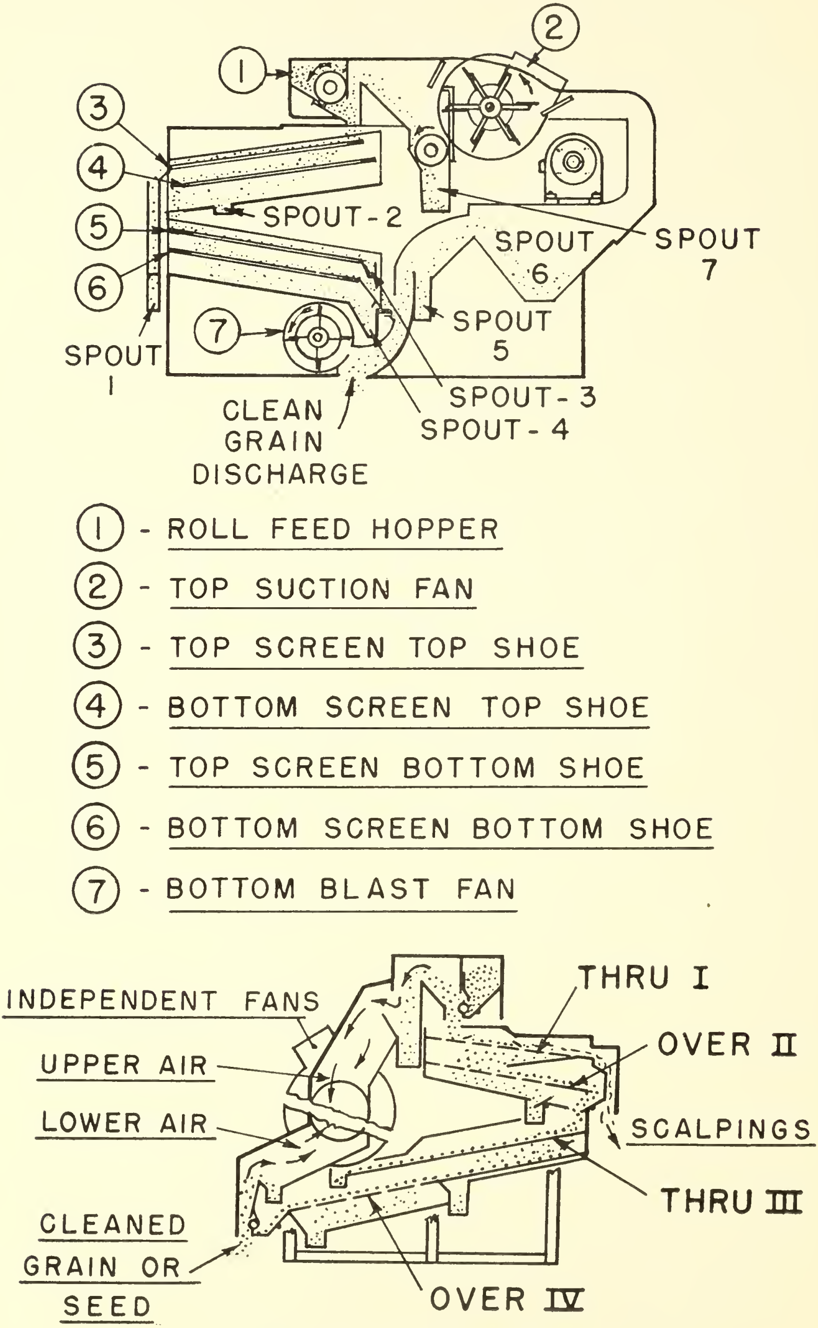

①
②
③
④
⑤
⑥
⑦
SPOUT-2
SPOUT 7
SPOUT 6
SPOUT 5
SPOUT 1
SPOUT-3
SPOUT-4
CLEAN GRAIN DISCHARGE
① - ROLL FEED HOPPER
② - TOP SUCTION FAN
③ - TOP SCREEN TOP SHOE
④ - BOTTOM SCREEN TOP SHOE
⑤ - TOP SCREEN BOTTOM SHOE
⑥ - BOTTOM SCREEN BOTTOM SHOE
⑦ - BOTTOM BLAST FAN
INDEPENDENT FANS
UPPER AIR
LOWER AIR
CLEANED GRAIN OR SEED
THRU I
OVER II
SCALPINGS
THRU III
OVER IV

Figure 1. Air and Screen Machine.

with one air blast to the large industrial type machine.

Operation

For this discussion a four-screen machine with the following screen arrangement will be used: first screen scalping, second screen grading, third screen close scalping, and fourth screen fine grading. Some machines are equipped so that other screen arrangements can be made.

The seed to be cleaned are fed from the bottom of the feed hopper by means of a feed roll. As they fall from the feed hopper, they pass through the upper air suction which removes most of the light chaff and dust before they reach the top screen. The upper air suction should be strong enough to pull out a few good seed along with the trash. Its force is usually regulated by an adjustable damper in the air passage.

The top screen is used for rough scalping. The perforations in this screen should be large enough to let the seed being cleaned drop through readily, but small enough to scalp off the large foreign material such as stems, sticks, dirt, and seed larger than the seed being cleaned.

A round-hole screen is usually best for removing long material such as straw, sticks, and stems. However, in some cases such as cleaning ryegrass or fescue that contains cheat or wild onions, a screen with oblong openings would be better.

The seed which pass through the first screen are caught on the second screen. The perforations in this screen are just large enough to allow the small trash, small weeds, and dirt to drop through and be removed from the machine. The good seed ride over the second screen and drop off onto the third screen. For maximum capacity, it is important that the second screen be covered at all times.

The third screen serves as the close scalper. It removes any foreign material or seed larger than the seed being cleaned but which was small enough to have passed through the first screen.

A large percentage of wild winter peas or vetch can be separated from oats by using 7/64 x 3/4 screen in the third position. The oats drop through the oblong openings while most of the peas and vetch are scalped off.

The seed that drop through the third screen go over the fourth screen for the final close grading. The fourth screen has perforations a little larger than the second screen. It removes any seed or other material smaller than the seed being cleaned but which was too large to drop through the second screen. Splits and immature seed are removed by this screen .

As the good seed drop off the fourth screen, they fall through the lower air blast. This air blast blows out the light seed and trash which was not removed by the upper air and screens. For efficient cleaning, the lower air should be strong enough to blow out a few good seed.

Other Adjustments

Adjustable Screen Pitch: The pitch of screens can be adjusted to place the screens in a steep or flat position. Setting a screen steep tends to cause a sharper separation just as though a smaller size screen were used. The scalpers are ordinarily set at a greater degree of pitch to facilitate scalping off the trash which would tend to drop through with the seed or stay on the screen and interfere with the seed dropping through. The bottom screens should be flattened to the point that undesirable seed and small inert material will have ample time to drop through and not be taken along with the good seed.

After a little practice an observant operator can set the correct pitch without difficulty.

Variable Shake of Screens: The vibration of the screens should be adjusted to

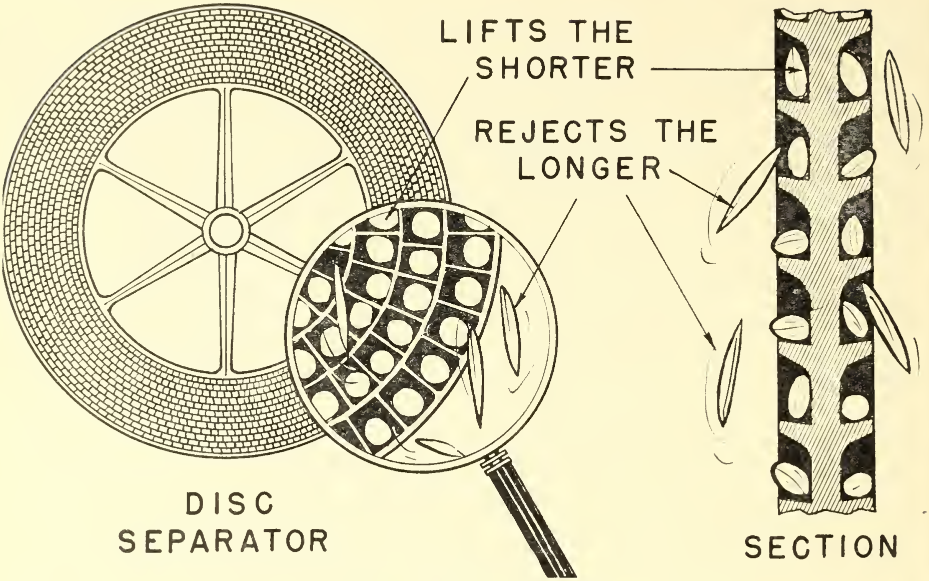


Figure 2. Disc Separator.

whatever speed is best suited for the particular separation. A speed too fast tends to bounce the seed so rapidly that they do not drop through the screen. However, a fast vibration can sometimes be used to make a sharper separation just as though a smaller screen were being used. If the shake is too slow, the seed will tend to lie dead on the screen. This causes the screen to clog up and poor cleaning is obtained.

Length Separators

Some varieties of seed have practically the same width or thickness and would be impossible to separate were it not for their difference in length. By taking advantage of the difference in length, a precise separation can be made with either a disc or cylinder type separator.

Disc Separator: The disc separator consists of a series of disc which revolve together on a horizontal shaft. Each disc contains hundreds of undercut pockets on each side. As the discs revolve the pockets lift out the short seed and reject the longer seed. The long seed are conveyed by the flights on the disc spokes to the end of the machine and discharged through the tailings gate.

The length of time the seed are exposed to the cleaning action of the discs can be controlled by raising and lowering the tailings gate. Raising the tailings gate tends to keep the seed in the machine longer and gives the disc more time to clean the seed thoroughly.

The disc pockets vary in size from the very small ones for cleaning clover to the larger ones for separating grains such as wheat and oats. The disc separators can be equipped with all disc having the same size indents or a combination of different sizes. In the combination type, the disc are divided into sections. Each section has different size disc. With this arrangement, the material both longer and shorter than the seed being cleaned can be removed.

Cylinder Separator: The cylinder separator consists of a long cylinder with hundreds of semi-spherical indents that line the inside surface of the cylinder.

As the cylinder revolves the short seed are lifted out of the mixture by the indents and dropped into a trough inside the cylinder. The degree of separation is controlled by the position of the separating edge of the trough. If some of the long seed are lifted out by the indents, the trough is set too low. If the trough is set too high, the short seed picked up by the indents will fall back into the mixture and be discharged with the long seed at the end of the cylinder.

Some cylinder separators are equipped with variable speed drives. The desirable speed can be determined by setting the trough level and then adjusting the speed of the cylinder so that the seed picked by the indents will fall into the trough from the top of the cylinder. It is important that the cylinder be run at the correct speed. If the speed is too fast, the indents will pick up some of the longer seed that would normally be rejected. If the speed is too slow, the indents will reject some of the short seed that should be lifted out.

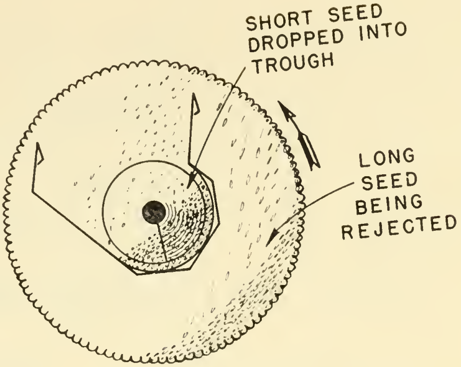

SHORT SEED DROPPED INTO TROUGH
LONG SEED BEING REJECTED

Figure 3. Cylinder Separator.

Cylinders with various size indents are available for making different separations.

Roll Mill (Dodder Mill)

The roll mill separates seed by their difference in seed coat texture, that is

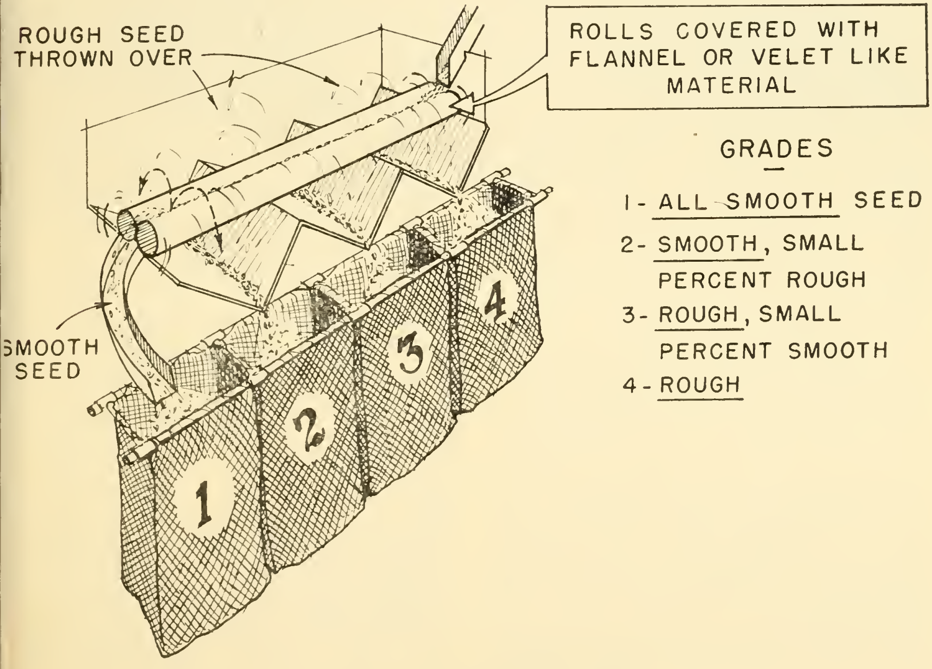

ROUGH SEED THROWN OVER
ROLLS COVERED WITH FLANNEL OR VELET LIKE MATERIAL
GRADES
1- ALL SMOOTH SEED
2- SMOOTH, SMALL PERCENT ROUGH
3- ROUGH, SMALL PERCENT SMOOTH
4- ROUGH
MOOTH SEED
1
2
3
4

Figure 4. Roll Mill (Dodder Mill).

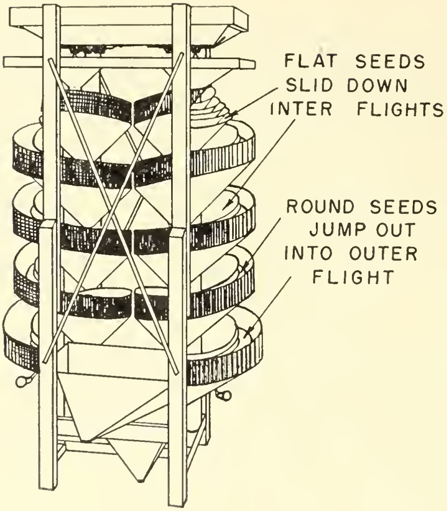


Figure 5. Spiral Separator.

the rough seed from smooth seed. A pair of rolls covered with a flannel like material are placed side by side close enough to touch lightly. The rolls are mounted in an incline position and turn in opposite directions, outwardly when viewed from the top.

The seed mixture is fed onto the rolls at the high end of the mill. As the seed travel downhill between the revolving rolls, the rough seed are caught by the flannel like rolls and thrown over the sides. The smooth seed continue bouncing downhill between the rolls and discharge off the end.

The seed thrown over the sides are caught in graduated grade hoppers underneath the mill. The grades of seed from these hoppers vary from a high percentage of rough seed from the one nearest the feed end of the mill to a very low percentage of rough seed from the one nearest the discharge end. The intermediate grade can be re-run to recover the smooth seed that were thrown out with the rough seed.

The dodder mill has two main adjustments—rate of feed and the speed of the rolls. If some of the rough seed are being discharged at the lower end with the smooth seed, the feed is too fast or the rolls are running too slowly. If too many of the smooth seed are being thrown over the sides, the rolls are running too fast. A good practice is to make one adjustment at a time. Let the machine run two or three minutes and observe the effect of the adjustment on the separation. After experimenting with the adjustment, the operator should have no trouble in making the proper settings.

Spiral Separators

Some seed such as wild winter peas and wheat differ so little in thickness and length that they cannot be separated satisfactorily with a screen machine or length grader. However, since the round peas roll more readily than the wheat, a separation can be made with a spiral separator.

The seed are fed onto the spirals from a hopper at the top. Going down the inclined flights, the round seed travel at a much faster speed. The momentum of the round seed increases until they go so fast that they run over the edge of

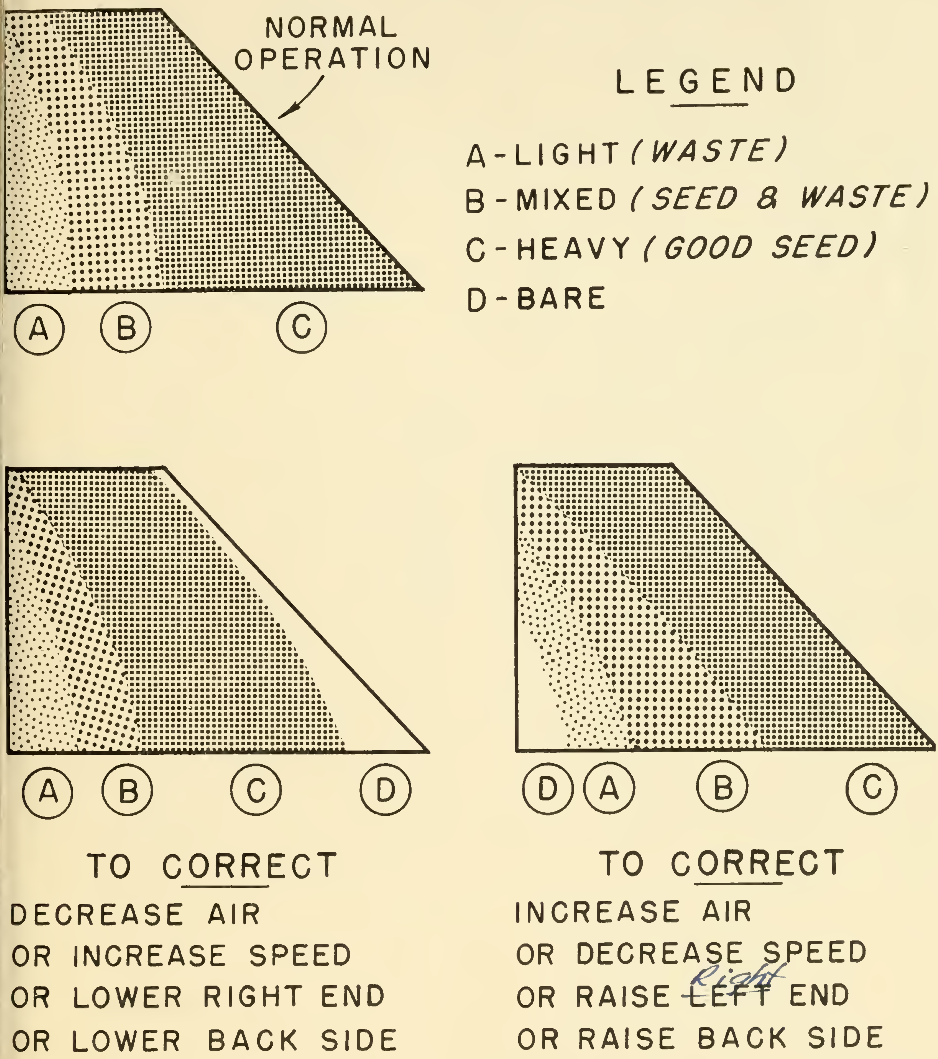
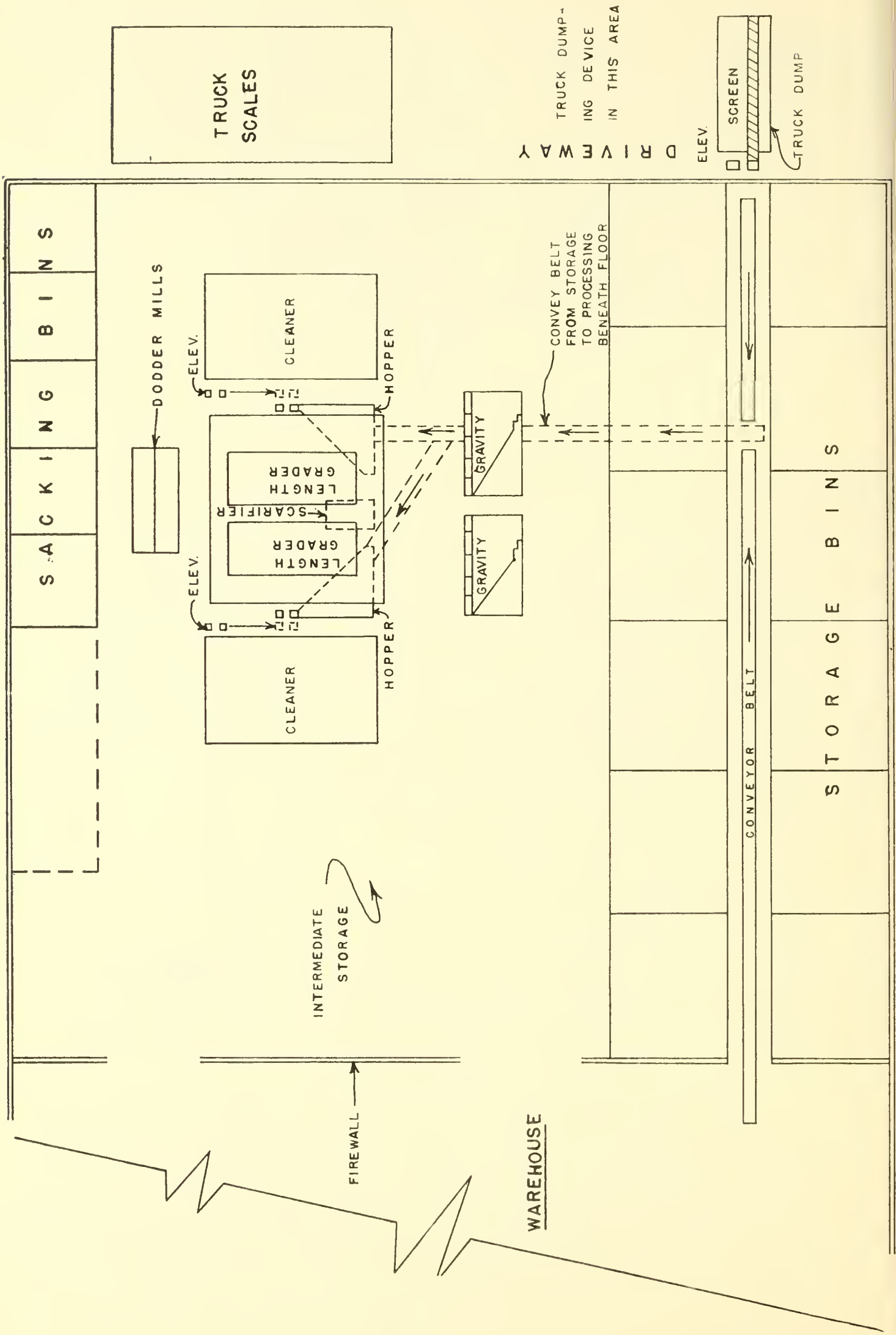

NORMAL OPERATION
LEGEND
A - LIGHT (WASTE)
B - MIXED (SEED & WASTE)
C - HEAVY (GOOD SEED)
D - BARE
A
B
C
A
B
C
D
TO CORRECT
DECREASE AIR
OR INCREASE SPEED
OR LOWER RIGHT END
OR LOWER BACK SIDE
D
A
B
C
TO CORRECT
INCREASE AIR
OR DECREASE SPEED
OR RAISE ~~LEFT~~ Right END
OR RAISE BACK SIDE

Figure 6. Specific Gravity Table.

the inner flights, drop into the outer flight and discharge through a spout under the machine. The other seed continue sliding down the inner flights to the bottom and discharge through another spout.

Specific Gravity Separator
(Gravity Table)

The seed to be separated are caused to flow across an inclined reciprocating deck. The deck is mounted on incline toggles which impart two motions to it; (1) an


TRUCK SCALES
TRUCK DUMPING DEVICE IN THIS AREA
DRIVEWAY
ELEV.
SCREEN
TRUCK DUMP
SACKING BINS
DODDER MILLS
ELEV.
CLEANER
HOPPER
CONVEY BELT FROM STORAGE TO PROCESSING BENEATH FLOOR
GRAVITY
LENGTH GRADER
SCARIFIER
LENGTH GRADER
GRAVITY
ELEV.
HOPPER
CLEANER
STORAGE BINS
CONVEYOR BELT
INTERMEDIATE STORAGE
FIREWALL
WAREHOUSE

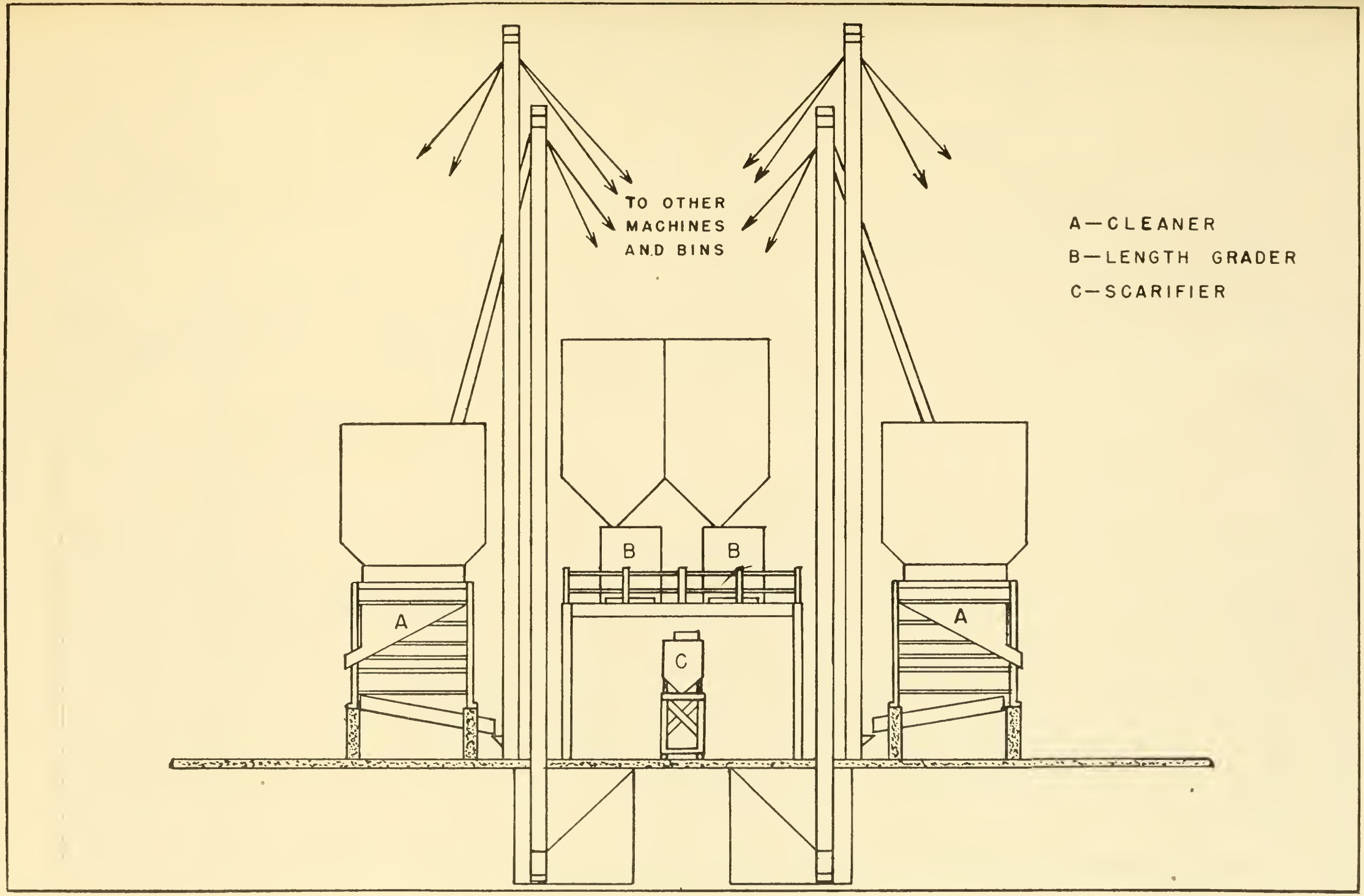

TO OTHER
MACHINES
AND BINS
A—CLEANER
B—LENGTH GRADER
C—SCARIFIER
A
B
B
C
A

Figure 8. Elevation view of machinery in floor plan on opposite page.

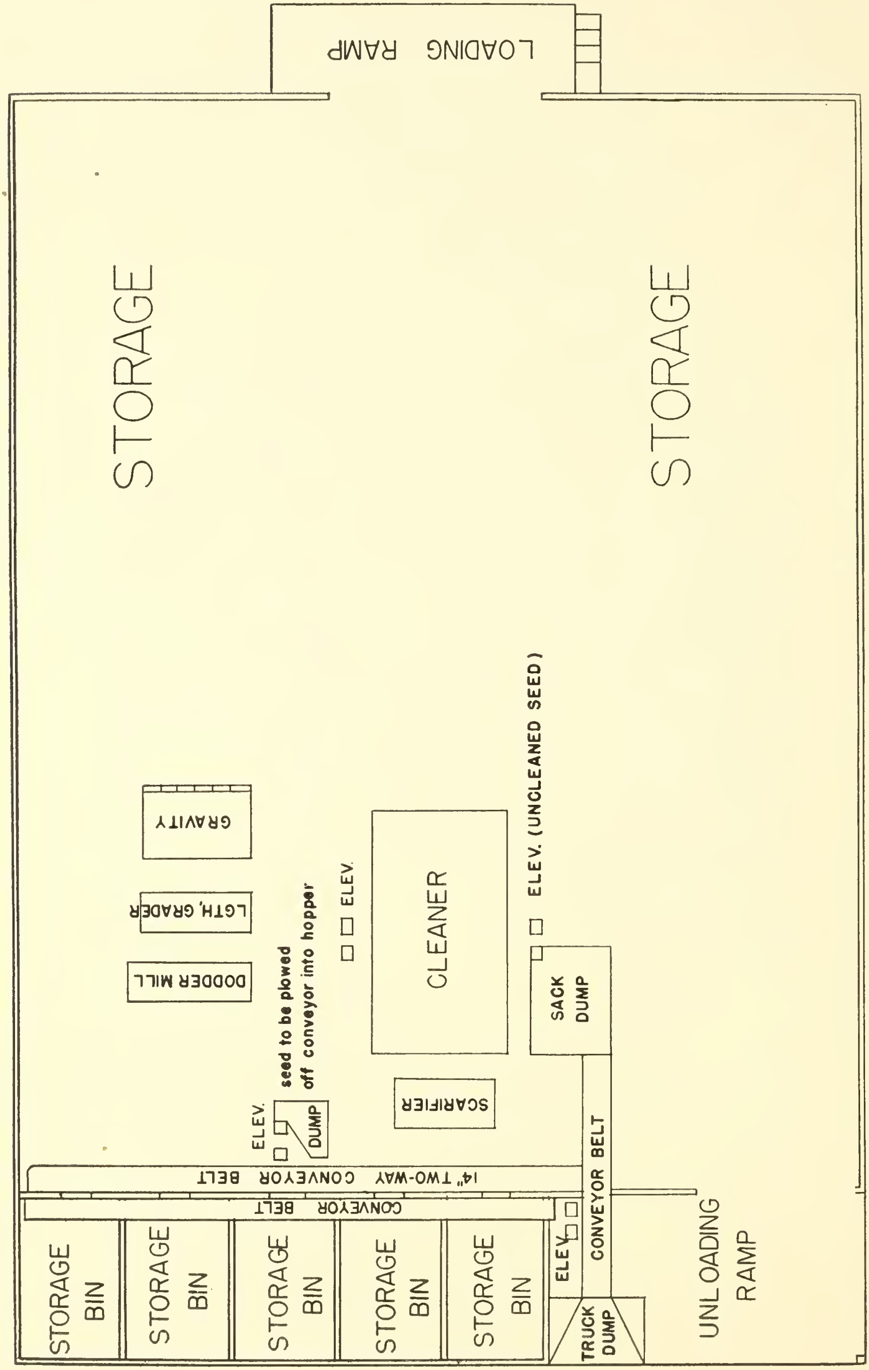

LOADING RAMP
STORAGE
STORAGE
GRAVITY
LGTH, GRADER
DODDER MILL
ELEV.
CLEANER
ELEV. (UNCLEANED SEED)
SACK DUMP
seed to be plowed off conveyor into hopper
ELEV.
DUMP
SCARIFIER
14" TWO-WAY CONVEYOR BELT
CONVEYOR BELT
CONVEYOR BELT
ELEV.
STORAGE BIN
STORAGE BIN
STORAGE BIN
STORAGE BIN
STORAGE BIN
TRUCK DUMP
UNLOADING RAMP

Figure 9. Floor Plan.

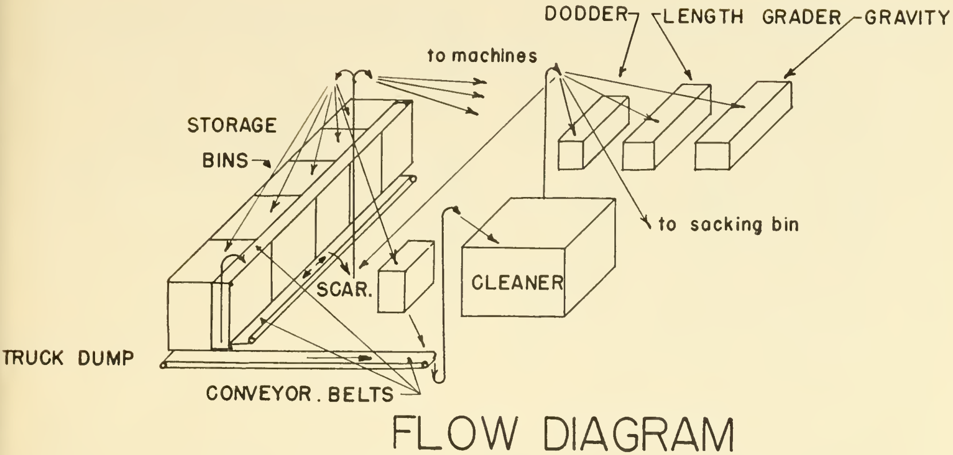


Figure 10. Flow diagram for floor plan in figure 9.

up and down motion, and (2) a backward and forward motion. The deck is covered with an open mesh material through which air is blown. The air is used to float the layer of seed in such a manner that it becomes stratified, the light seed rising up to the top, and the heavier seed settling to the bottom. The up and down motion of the deck pitches the seed up so that stratification is more quickly effected. The backward and forward motion causes the heavier seed to travel uphill because these seed are in contact with the deck surface. If excessive air is used, the seed will not be in good contact with the deck and will not travel uphill.

Types of Decks

Most seed separations are made on either a cloth or a wire deck. The cloth deck is used for the smaller seed such as alfalfa, clover, lespedeza, etc. Seed such as wheat, beans, corn, peas, etc. are separated on a wire deck. It takes more air to float these seed.

There are other types of decks for special separations.

Adjustments

The gravity separators are provided with five main adjustments:

1. **Amount of Air:** The amount of air is controlled by the adjustable gate on the suction side of the fan. Since the air governs the stratification enough must be used to cause the seed to become fluid or floating. Only the minimum amount of air necessary to float the seed should be used. Too much will cause the seed to travel toward the low side of the deck. Insufficient air will cause the lighter seed to travel toward the high side of the deck along with the good seed. At no time should any portion of the deck be bare as this would result in an uneven distribution of air through the deck.

2. **Longitudinal Inclination of Deck:** To make a separation on a gravity table the seed must be made to travel uphill. The heavier seed, which have settled to the surface of the deck, are carried to the high end of the deck by the backward and forward motion. The lighter seed and trash which are floating on top of the seed layer will float downhill to the low side of the deck. The deck should

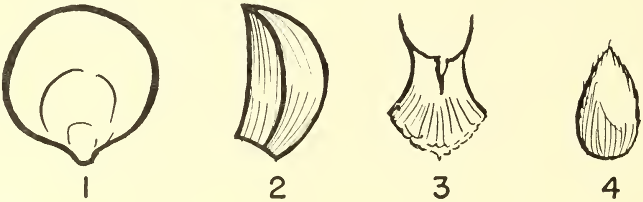
have considerable inclination for most separations. Decks with riffles should have less slope than plain decks. However, the slope should never be increased to the point that material will begin leaving the back rail.

3. **Lateral Inclination of Deck:** The lateral inclination (side slope) should be such that a uniform layer of seed is discharged all along the front edge of the deck. Decreasing the side slope causes more material to flow toward the high end of the deck. Increasing the side slope causes more material to flow to the low end. Blank decks are generally operated with less side slope than riffled decks.

4. **Rate of Feed:** The rate of feed is regulated by adjusting the feed hopper on the separator. It is important that the separator be fed to its capacity. The separator will operate more satisfactorily when fed to its capacity than when fed slowly. The rate of feed should be uniform at all times.

SUGGESTED PROCESSING PROCEDURE FOR SOME OF THE MAJOR CROPS

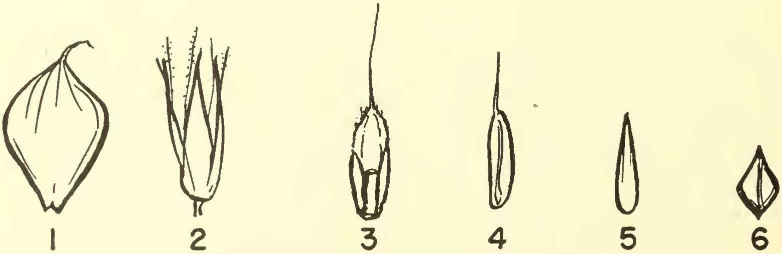
SORGHUM and Weeds Commonly Found



(1) **Sorghum,** (2) morning glory, (3) prickly sida, (4) Johnson grass.

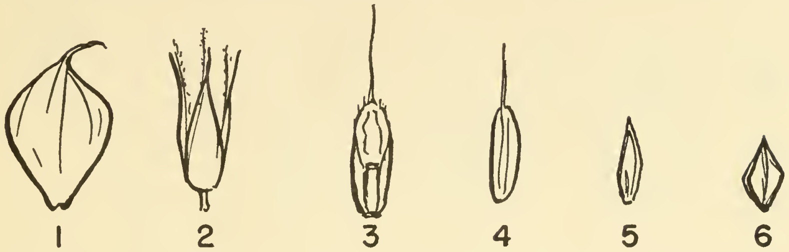
Machines for processing: Air and screen machine—Johnson grass and prickly sida will drop through lower screens. Morning glory can be removed by using a 10 round or 11 triangle in the bottom position.

RYEGRASS and Weeds Commonly Found



(1) Wild onions, (2) wild barley, (3) darnel, (4) cheat, (5) **ryegrass,** (6) dock.
Machines for processing: See Fescue.

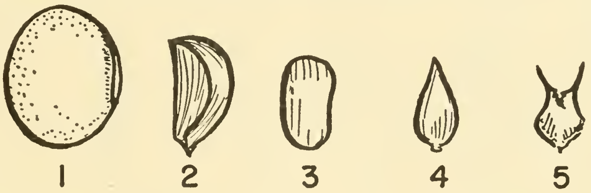
FESCUE and Weeds Commonly Found



(1) Wild onions, (2) wild barley, (3) darnel, (4) cheat, (5) **fescue,** (6) dock festuca spp.

Machines for processing: Air and screen machine—A large percentage of the above weeds can be removed during the first cleaning operation. Use a 6, 6½, or 7 round hole in the third screen position to remove cheat. Use a 5 triangle in the fourth screen position to remove dock. Disc or cylinder separator—Removes dock, clover and small trash.

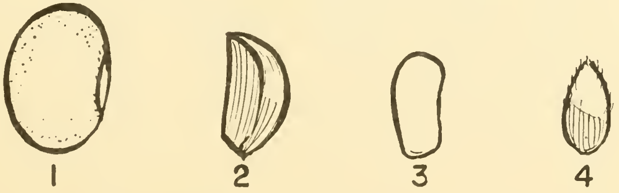
SOYBEANS (LARGE) and Weeds Commonly Found



(1) **Soybeans (large),** (2) morning glory, (3) coffee weed, (4) Johnson grass, (5) prickly sida.

Machines for processing: Air and screen machine—All the above weeds can be removed when the beans are cleaned. Since soybeans are relatively heavy, a strong blast should be used to blow out light weed seed and trash that was not removed by the screens. Spiral separator—Removes splits from the good beans.

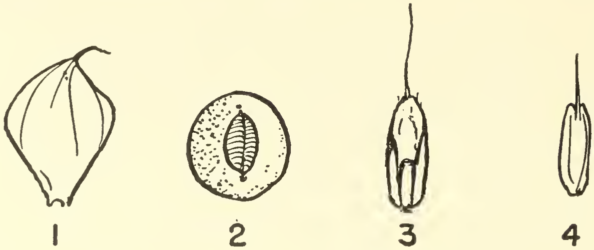
SOYBEAN (SMALL) and Weeds Commonly Found



(1) Soybean (small), (2) morning glory, (3) coffee weed, (4) Johnson grass.

Machines for processing: Air and screen machine—Coffee weed and Johnson grass are dropped through lower screens. A 10 round hole or 11 triangle will drop morning glory.

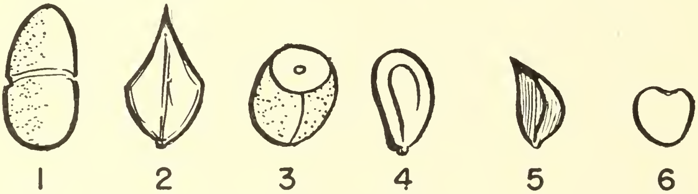
WILD WINTER PEAS and Weeds Commonly Found



(1) Wild onions, (2) **wild winter peas,** (3) darnel, (4) cheat.

Machines for processing: Air and screen machine—Cheat can be removed when the peas are cleaned. A strong air blast should be used. A large portion of wild onions and darnel can also be removed. **Gravity table**—Separates the onions that passed through the screens with the peas. **Disc or cylinder separator**—Separates most of the darnel from the peas. **Scarifier**—For scarifying the seed.

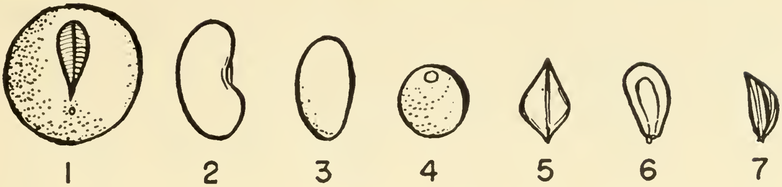
WHITE DUTCH CLOVER and Weeds Commonly Found



(1) Plantains, (2) dock, (3) dodder, (4) peppergrass, (5) evening primrose, (6) **white dutch clover.**

Machines for processing: Air and screen machine—A large portion of all the given weeds can be removed during the first cleaning. If the clover contains dock, use a 6 x 22 or 6 x 23 wire mesh screen in third position. Blank off the lower section of the screen up to the point where all the clover has dropped through. This will usually be about three-fourths or two-thirds of the screen. Blanking off the lower section of the screen permits an excellent separation since the dock rides onto the blanked off section and has no further opportunity to drop through the screen with the clover. **Gravity table**—Removes plantains, peppergrass, and evening primrose that passed through the screens with the clover. Also, removes sand, light trash and immature seed. **Dodder mill**—Removes dodder and other rough coated seed.

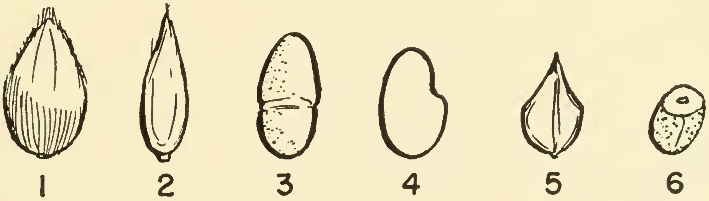
CRIMSON CLOVER and Weeds Commonly Found



(1) Narrow leaf vetch, (2) **crimson clover,** (3) wild geranium, (4) wild mustard, (5) dock, (6) peppergrass, (7) primrose.

Machines for processing: Air and screen machine—Most all the given weeds, except wild geranium, dock and wild mustard can be removed during first cleaning **Gravity table**—Separates the wild mustard from the clover. **Dodder mill**—Can be used to reduce the wild geranium content. It is very difficult to remove all wild geranium seed from crimson clover.

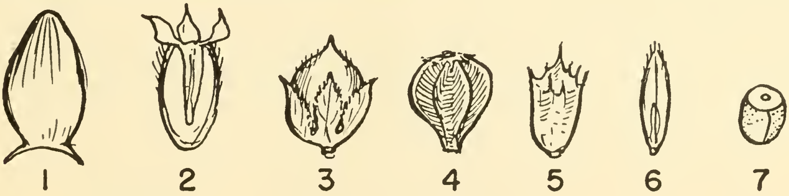
RED CLOVER and Weeds Commonly Found



(1) Johnson grass, (2) canary grass, (3) plantains, (4) **red clover,** (5) dock, (6) dodder.

Machines for processing: Air and screen machine—Dock and unhulled Johnson grass can be separated during the cleaning operation. A large portion of dodder, plantains and canary grass can be removed during first cleaning. **Gravity table**—Separates plantain from the clover. **Dodder mill**—Separates dodder from clover. **Clover disk or cylinder separator**—Separates canary grass from the clover.

LESPEDEZA and Weeds Commonly Found

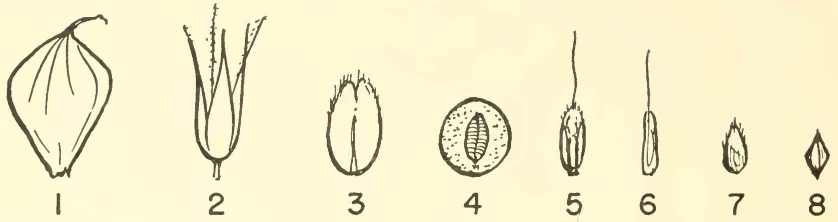


(1) Beggar tick, (2) buttonweed, (3) **lespedeza,** (4) sump weed,* (5) ragweed, (6) crabgrass, (7) dodder.

Machines for processing: Air and screen machine—Removes beggar tick, button weed, crabgrass, and ragweed. Also, dodder if lespedeza is unhulled. **Dodder mill**—Removes dodder from hulled lespedeza. Separates hulled from unhulled lespedeza.

*So far as is known, no satisfactory method has been found for removing sump weed from lespedeza.

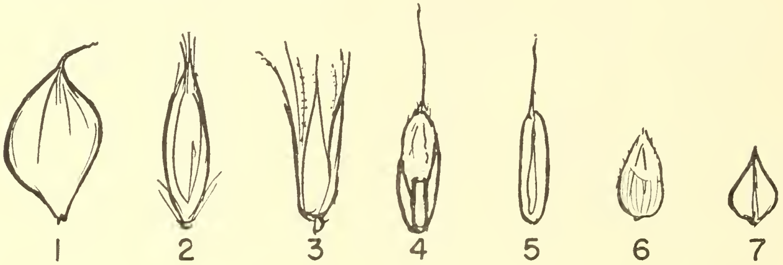
WHEAT and Weeds Commonly Found



(1) Wild onions, (2) wild barley, (3) **wheat,** (4) wild winter pea, (5) darnel, (6) cheat, (7) Johnson grass, (8) dock.

Machines for processing: Air and screen machine—Cheat, dock, Johnson grass, and wild barley are removed when the wheat is cleaned. A large percentage of wild onions can also be removed. A strong air blast should be used to help remove the weed seed and trash. **Gravity**—Removes wild onions that passed through screen with wheat. **Spiral separator**—Removes wild winter peas and vetch.

OATS and Weeds Commonly Found



(1) Wild onions. (2) **oats,** (3) wild barley, (4) darnel, (5) cheat, (6) Johnson grass, (7) dock.

Machines for processing: Air and screen machine—Cheat, dock, Johnson grass, and wild barley can usually be removed when cleaning the oats. A strong air blast should be used as this will remove any wild barley that dropped through the screen with the oats. A large portion of wild onions and darnel can also be removed during the first cleaning. **Disc or cylinder separator**—Removes cheat, wild onions, wild winter peas, vetch and other seeds shorter than oats.

SUGGESTED SCREEN

CRIMSON CLOVER

Screen Location:

1	6 or 1/12 scalps off trash, large weed seed.
2	6x23 or 6x22 drops thin seed, small trash, sand, etc.
3	1/13 scalps off more weed seeds and trash.
4	6x22 or 6x20 drops thin seeds, small trash, and sand.

LADINO CLOVER

Screen Location:

1 1/18, 1/20 scalps off trash and large weed seed.
2 6x32 drops thin seed and sand. 24x24 or 26x26 drops hop clover.
3 1/21 or 1/22 for scalping additional trash. 6x21 or 6x22 for removing sorrel.
4 6x32 or 6x30 drops small seed.

RED CLOVER

Screen Location:

1 1/14 or 1/15 scalps off trash and large weed seed.
2 6x26 or 6x24 drops thin seed and sand.
3 3/64 or 5/16 removes ragweed, dock, and hares ear mustard.
14x14 or 15x15 wire mesh if clover contains foxtail or paspalum.
4 6x24 drops small seed and sand. 6x22, 6x21, or 6x20 if clover contains buckhorn or plantains.

WHITE CLOVER

Screen Location:

1 1/18, 1/19 or 1/20 scalps off trash and other large seed.
2 6x32 or 6x30 drops thin seed, trash, and sand.
3 1/20, or 1/21 for scalping off larger seeds and small trash.
6x21, 6x22, or 6x23 if clover contains dock or sorrel.
4 6x32 or 6x30 drops thin seed. 20x22 drops small seed such as hulled timothy, hop clover, etc.

FESCUE, Kentucky 31

Screen Location:

1 10 or 8 scalps straw and trash or 3/64x5/16 to scalp off wild onions, dock, cheat, etc.
2 6x34 or 6x32 drops thin seed and sand.
3 1/22x1/2 or 1/24x1/2 screens out additional wild onions, cheat, dock, etc.
4 6x30 drops thin seed and trash. 5 triangle drops small dock, sorrel, clover, etc.

KOBE LESPEDEZA

Screen Location:

1 9, 8 or 7-1/2 scalps off trash and large weeds.
2 1/14 or 1/15 drops hulled kobe, dock, and dodder.
6x22 or 6x21 drops horsenettle, plantain, etc.
3 1/18x3/4 screens removes pojo, ragweed, and other large weed seed.
4 1/14 or 1/12 drops additional hulled seed and small weed seed.

KOREAN LESPEDEZA

Screen Location:

1 8 or 6 scalps off trash and large weed seed.
2 1/18, 1/17 or 1/16 drops small dodder and sand, 6x22, 6x21, or 6x20 drops horsenettle, plantain, etc.
3 6x15 screens out pojo, spring sida, ragweed, etc.
4 1/16 or 1/15 drops hulled seed and dodder.

SERICEA LESPEDEZA (unhulled)

Screen Location:

1 8 or 7 scalps off trash and large weed seeds.
2 1/17 or 1/16 drops hulled seed, dodder, plaintain, etc.
3 1/18x1/2 or 1/18x3/4 scalps off additional trash and weed seeds.
4 1/15 drops dock, dodder, plantain, buckhorn, etc.

Note: If dodder is present, it should be dropped before scarifying the lespedeza.

OATS

Screen Location:

1 18 or 20 scalps off straw, etc.
2 1/16x1/2, 1/15x1/2, or 1/14x1/2 drops thin groats, chaff, and small weed seeds. 9, 10, or 11 triangle drops wild mustard and wild buckwheat.
3 7/64x3/4, 8/64x3/4, or 9/64x3/4 screens out other trash, thistle heads, etc.
4 1/13x1/2, or 1/14x1/2 drops pin oats and groats.

PEAS (Caley, Singletary, or Wild Winter)

Screen Location:

1 16 or 14 scalps off trash.
2 6/64x3/4 drops immature seed, sand, small trash, and weed seed.
3 12 or 13 screens out additional trash and long seeds.
4 6/64x3/4 or 6-1/2 x 3/4 drops shrivelled seed.

RYEGRASS

Screen Location:

1 10 or 8 scalps off straw and trash or 3/64x5/16 scalps off wild onions, cheat, dock, etc.
2 6x32 or 6x30 drops thin seed and small trash.
3 1/22x1/2 scalps off additional wild onions, cheat, dock, etc.
4 6x30 or 6x28 drops thin seed. 5 triangle to drop small dock, sorrel, clover, etc.

SOYBEANS—medium yellow (Arksoys, Clemson, Ogden, Ralsoys)

Screen Location:

1 24 or 22 scalps off large trash.
2 9/64x3/4 or 10/64x3/4 drops small trash, weed seed, splits, etc.
11 or 12 drops morning glory, pigweed, and other small weed seed.
3 21 or 20 for close scalping.
4 11/64x3/4 drops small beans and splits.

SOYBEANS—Laredo

Screen Location:

1 20 or 18 scalps off pods and trash.
2 9 or 10 drops small weed seed.
3 8/64x3/4 or 9/64x3/4 screens out large weed seeds.
4 1/12x1/2 or 1/13x1/2 drops splits and small beans.

WHEAT

Screen Location:

1	18, 16 or 14 scalps off straw, etc.
2	1/14x1/2 drops sand and weed seeds. 11 or 12 drops morning glory.
3	12 or 14 scalps off additional stems, etc.
4	1/13x1/2 or 1/14x1/2 drops broken kernels, and grass seed.

EQUIPMENT FOR PROCESSING HYBRID SEED CORN

Sheller—A sheller made especially for shelling seed corn is preferable. However, most commercial shellers can be used satisfactorily if the sharp edges on the shelling teeth or bars are rounded off with a file and the sheller operated at approximately one-half of the recommended speed. Since high speeds can cause considerable damage to the kernels, it is important that the sheller be operated at a slow speed.

Air and screen machine—After the corn has been shelled, it should be cleaned to remove large trash, pieces of cobs, cracked grains, and other small material. A two screen machine is usually sufficient. However, if closer screening is desired, a machine with more screens can be used. A strong air blast should be used during the cleaning operation. This helps to remove light kernels and other light material which is the same size as the good seed.

Thickness grader—When only the flat seeds are to be processed, a cylinder type thickness grader can be used to remove the thick and round grains. If the thicks and rounds are to be processed, also, this operation may be omitted.

Thickness and width grader—This type grader is used when both the flat and round kernels are to be processed for seed. The corn can be divided into the various grades of thickness and width with a screen type or a cylinder type grader equipped with round hole and slotted screens of different sizes.

With some machines it is possible to get up to twelve different grades in one operation. Two screen arrangements for a screen type grader is given below. These arrangements are commonly used in some parts of the South.

1st position	24 round hole and 13-13-14 slotted
2nd position	22 round hole and 12-12-13 slotted
3rd position	20 round hole and 12-12-13 slotted
4th position	18 round hole and 12-12-12 slotted or 11-11-11 slotted
1st position	22 round hole and 13-13-13 slotted
2nd position	19 round hole and 12-12-12 slotted
3rd position	19 round hole and 12-12-12 slotted
4th position	16 round hole and 11-11-11 slotted

Length grader—The length grader is used to make length separations in the flat grades which have a high degree of variability. It is usually a cylinder type grader similar to the one discussed elsewhere in this bulletin.

Gravity table—The specific gravity separator can be used to remove any rotten kernels that were not blown out by the air blast. When seed corn is harvested earlier, it will seldom contain enough damaged kernels to necessitate the use of this machine.

Picking belts—The picking belt is used when there are off-color kernels that have to be removed from the seed. The seed are fed onto a moving belt and as it travels along the off-colored kernels are picked off by several persons standing beside it. This operation is omitted if there are no off-colored kernels.

Treater—Corn can be treated with dust or slurry (liquid) type treater. However, it appears that the slurry treater is more popular for treating corn.

SUGGESTED SCREENS FOR OTHER CROPS

	Screens			
Commodity	1	2	3	4
Alfalfa	1/13 or 1/14	6 x 24	1/14 or 1/15	6 x 23
Bahia grass—Argentine	8	15 x 15	1/16 x 1/2	1/13
Common	9	12 x 12	1/14 x 1/2	1/15
Pensacola	6	17 x 17	1/18 x 1/4	1/17
Barley	16	1/14 x 1/2	9/64 x 3/4	1/13 x 1/2
Bermuda grass—hulled	1/25	38 x 38	28 x 28	6 x 42
Bermuda grass—unhulled	1/18	32 x 32	6 x 24	6 x 38
Carpet grass	1/13	32 x 32	6 x 22	6 x 40
Clover—Alyce	1/16	20 x 22	1/22 x 1/2	6 x 24
Hop	1/25	38 x 38	22 x 22 or 24 x 24	6 x 38
Hubam—hulled	1/16	20 x 20	3/64 x 5/16	6 x 24
Hubam—unhulled	7	20 x 20	1/14 x 1/2	6 x 24
Sweet—hulled	1/13	6 x 26	1/14	6 x 24
Sweet—unhulled	10	6 x 26	9 or 8	6 x 24
Crotalaria giant striata	8	14 x 14	1/14 x 1/2	6 x 22
Crotalaria intermedia	6	16 x 16	1/15 x 1/2	6 x 20
Crotalaria spectabilis	14	7, 8	1/12 x 1/2	7, 8
Dallis grass	9	4 x 30	6 x 14	4 x 28
Johnson grass	9	1/17	1/13 x 1/2	1/16
Lespedeza—common	6	1/17	6 x 15	1/15
Lupine—blue	24	9/64 x 3/4	21	10/64 x 3/4
sweet yellow	26	12	24	7/64 x 3/4
white	22	12	20	7/64 x 3/4
yellow bitter	20	12	12/64 x 3/4	6/64 x 3/4
Milo, maize	13, 14	1/13 x 1/2	12	1/12 x 1/2
Peas—large cow	22	12	21	11/64 x 3/4
medium cow	18	10	16	9/64 x 3/4
small cow	14	8	12	7/64 x 3/4
Rescue grass	16	1/18 x 5/64	6/64 x 3/4	9 or 10 Tria.
Rye	14, 16	1/16 x 1/2	12	1/14 x 1/2
Sesame	6, 7	17 x 17	1/20 x 1/2	6 x 28
Sudan grass	10, 12	1/15	1/12 x 1/2	3/64 x 5/16
Sweet sudan grass	10, 11	1/12	6/64 x 3/4	1/18 x 3/4
Vetch—Hairy	16	6/64 x 3/4	14	6/64 x 3/4

M69b
no.521

BULLETIN 521 JUNE, 1954

PROPERTIES AFFECTING WATER RELATIONS AND MANAGEMENT

of 14 Mississippi Soils

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DEC 2 1954

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Properties Affecting Water Relations and Management of Fourteen Mississippi Soils

By

W. M. Broadfoot and W. A. Raney [1]

During the course of soil-moisture and other soil investigations in Mississippi, certain properties of representative soils were measured.[2] The properties included soil texture, plasticity, organic matter content, pH, bulk density, 1/3- and 15-atmosphere tension values, and infiltration and drying rates. These properties influence the intake, transmission, and retention of soil moisture, and in turn affect irrigation, drainage, and tillage practices.

Fourteen soils in the following thirteen series were investigated: Memphis, Loring, Grenada, Briensburg, Collins, Commerce, Sharkey, Bosket, Pachuta, Savannah, Sawyer, Stough, and Wahee. The Memphis series included an eroded phase and a soil with near-virgin conditions. It is hoped that the information given herein will aid in the identification and management of these soils.

Description of Soils

All soils except the near-virgin Memphis were old-field soils that at one time or another had been plowed, grazed, or otherwise disturbed. Some of the soils were not modal, or at least not representative of the most usual conditions of all soils in that series, but all came within the limits of characteristics prescribed in the official descriptions of the Soil Survey of the U. S. Department of Agriculture. The Collins soil was overlain by 6 to 18 inches of fill from old drainage ditches. The soil identified as Commerce was an over-wash phase with approximately 12 inches of slackwater deposits of Sharkey clay material at the surface.

The fourteen soils are among the principal ones of the state. The Memphis, Loring, and Grenada occur in uplands of the Brown Loam area (figure 1). Briensburg and Collins are also found in the Brown Loam area, but at the bases of slopes and along streams. Commerce, Sharkey, and Bosket are Delta soils. Pachuta is important in the Central Prairie. Savannah, Sawyer, Stough, and Wahee are widely distributed in the Longleaf Pine area, and are also found in the Sand-Clay Hills, the Flatwoods, and the Pontotoc Ridge.

Methods and Procedures

Representative bulk samples of the principal horizons or layers of each soil were taken from pit walls. Duplicate undisturbed cores were obtained for the determination of bulk density. Mechanical composition, plasticity constants, and moisture-tension values at 1/3 and 15 atmospheres pressure were determined from separate composite bulk samples.

In the laboratory the bulk samples were crumbled and crushed by hand to pass through a U. S. standard 9-mesh sieve. Particle size distribution and plasticity limits were determined for 10 of the soils in the soils laboratory of the Waterways Experiment Station at Vicksburg, Mississippi. The other samples were analyzed by the Mississippi Agricultural Experiment Station and the Vicksburg Infiltration Project.

Moisture tension values were determined by the pressure-membrane method (*3*).[3] Asbestos board was used as a membrane at 1/3-atmosphere pressure, and Visking sausage casing was used at a pressure of 15 atmospheres.

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[1] Soil Scientist, U. S. Forest Service; and Agronomist, Mississippi Agricultural Experiment Station, respectively.

[2] Data and information were obtained cooperatively by the Vicksburg Infiltration Project of the Southern Forest Experiment Station, and the Department of Agronomy, Mississippi Agricultural Experiment Station, State College, Mississippi. The Vicksburg Infiltration Project is maintained at Vicksburg, Mississippi, cooperatively by the Forest Service, U. S. Department of Agriculture, and the Corps of Engineers, U. S. Army.

[3] Italic numbers in parentheses refer to Literature Cited.

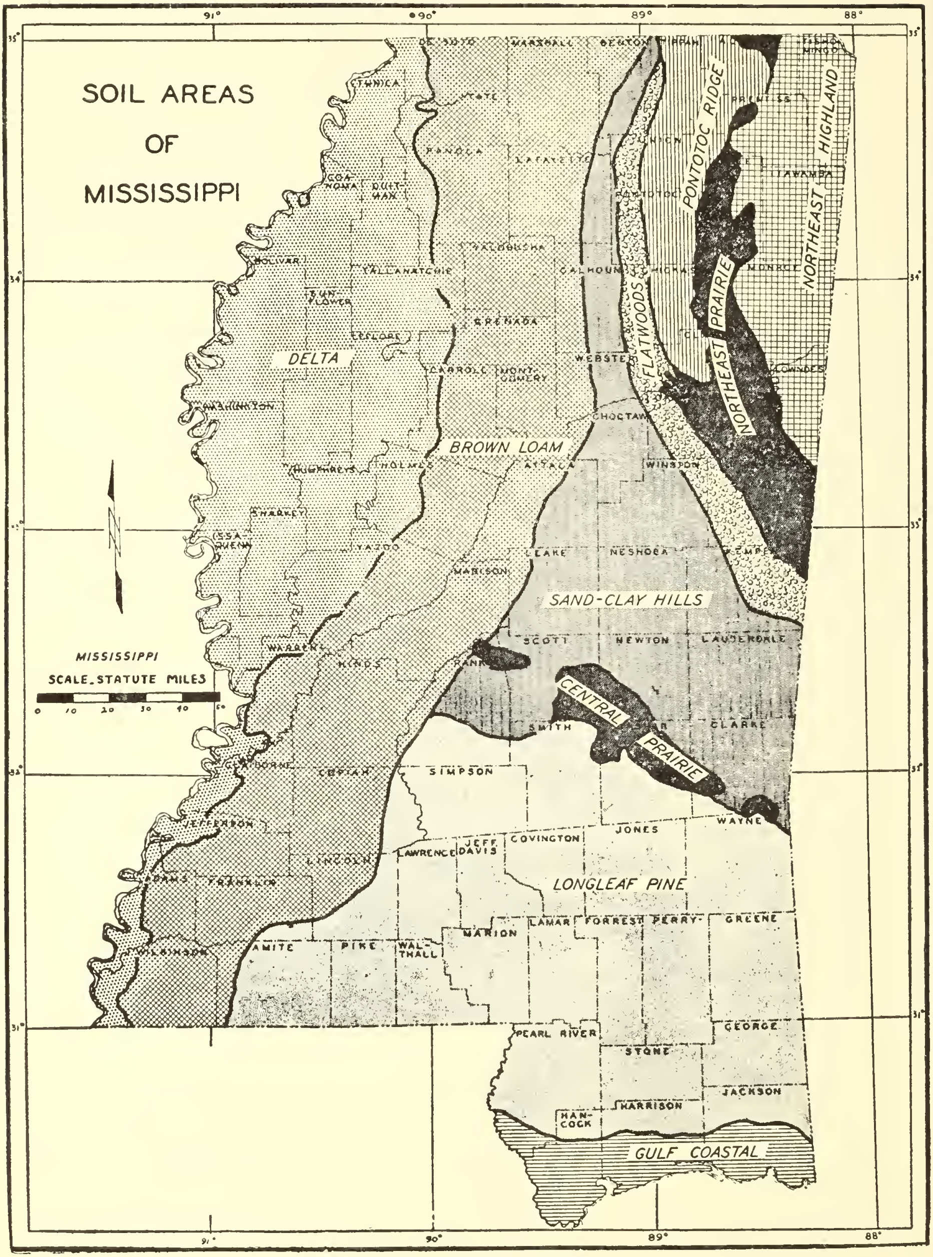
SOIL AREAS OF MISSISSIPPI
DELTA
BROWN LOAM
FLATWOODS
PONTOTOC RIDGE
NORTHEAST PRAIRIE
NORTHEAST HIGHLAND
SAND-CLAY HILLS
CENTRAL PRAIRIE
LONGLEAF PINE
GULF COASTAL
MISSISSIPPI
SCALE-STATUTE MILES
0
10
20
30
40
50
91°
90°
89°
88°
35°
34°
33°
32°
31°
DE SOTO
MARSHALL
BENTON
TUNICA
TATE
PRENTISS
TISHOMINGO
PANOLA
LAFAYETTE
COAHOMA
QUITMAN
PONTOTOC
ITAWAMBA
YALOBUSHA
BOLIVAR
TALLAHATCHIE
CALHOUN
CHICKASAW
MONROE
SUNFLOWER
GRENADA
LEFLORE
CARROLL
MONTGOMERY
WEBSTER
LOWNDES
WASHINGTON
CHOCTAW
HUMPHREYS
HOLMES
ATTALA
WINSTON
SHARKEY
ISSAQUENA
YAZOO
LEAKE
NESHOBA
KEMPER
MADISON
SCOTT
NEWTON
LAUDERDALE
WARREN
HINDS
RANKIN
SMITH
CLARKE
CLAIBORNE
COPIAH
SIMPSON
JEFFERSON
JONES
WAYNE
LINCOLN
LAWRENCE
JEFF DAVIS
COVINGTON
ADAMS
FRANKLIN
LAMAR
FORREST
PERRY
GREENE
WILKINSON
AMITE
PIKE
WALTHALL
MARION
PEARL RIVER
GEORGE
STONE
JACKSON
HARRISON
HANCOCK

Figure 1. Soil areas of Mississippi.

Bulk densities of the Memphis, Briensburg, Pachuta, Stough, Sawyer, and Wahee soils were measured with the air-picnometer (*4*). Values were derived from nomographs which related field weight and air volume to bulk density. No significant difference was found between this and more conventional methods. For the remaining soils, bulk densities were determined either from blocks of soil one foot square and 3 inches in height, or by other methods in which undisturbed soil cores were oven-dried and weighed (*1*).

With the Rocky Mountain infiltrometer (*2*), infiltration rates were determined for 10 of the soils. The general procedure was to apply 5 inches of simulated rainfall per hour for 1 to 4 hours when the soil was relatively dry and then to repeat the application within the next 3 days while the soil was still wet.

Daily soil moisture records were secured for all soils except Grenada, Sharkey, Bosket, and Savannah. From these records was determined the average number of days required for the soil to dry from maximum field value to average field minimum.

In the tables and discussions of each soil that follow, certain properties and units of measure need explanation:

The **Munsell color code** was used as a standard in naming the soil colors. Unless otherwise stated, the color represents moist soil.

The **plastic limit** is the moisture content at or above which a soil will puddle if handled; **liquid limit** is the moisture content at which a soil will barely flow under an applied force; the **plasticity index** is the range in moisture content between these two limits.

Total pore space was calculated from the bulk density of the soil by using 2.65 as specific gravity for soil with low organic matter content and 2.60 for soils with about 5 percent organic matter.

Moisture content at **1/3-atmosphere tension** is considered the approximate upper limit of available water or field capacity, and at **15 atmospheres tension** the point at which plants wilt. **Available water capacity** is the difference between the two. **Drainage capacity** is the difference between the total pore space and the pore space occupied by water at 1/3-atmosphere tension. Values for these properties are expressed on a volume basis for ready conversion to inches depth.

The drying period, a value of interest to irrigators, was considered at the time required for a soil to reach wilting point following saturation. Drying periods are given by soil groups: the upland loess soils, the colluvial-alluvial stream bottomland soils, fine clay soils, and the Coastal Plain soils.

Memphis Silt Loam

The near-virgin Memphis soil, developed in loess, was on gently sloping upland under a well-stocked hardwood forest near Vicksburg, Mississippi. Properties of this soil are shown in table 1. Because of the forest cover, the surface 6-inch layer had a high organic content and porosity, and low available water capacity. This layer has a large volume of big pores (39 percent by volume) and is therefore very receptive to water; but only 11 percent of its volume can be occupied by water available to plants.

Drainage capacity, or aeration, decreases from 39 percent for the surface layer to 5 percent for the layer beginning at 19 inches. There is a corresponding, but less sharp, increase in bulk density, or compactness, and in moisture retained after drainage. The increase in wilting point below 14 inches can be attributed to the increase in clay content.

This soil, in its present condition, could be plowed at a moisture content up to about 35 percent (the plastic limit) without causing it to puddle or form hard clods.

Data in table 1 may be used in irrigation practice to estimate the amount of water needed and the time necessary to apply it. For example, when the soil is dry or near the wilting point, the available water capacity of the entire 42-inch profile is 6.8 inches (obtained by multiplying the percentage of available water in each layer by

Table 1. Memphis silt loam (virgin).

Item	Soil layer 1	Soil layer 2	Soil layer 3	Soil layer 4
Depth	0 to 6 inches	6 to 14 inches	14 to 19 inches	19 to 42 inches
Color	Dark grayish brown (10 YR 4/2)	Brown (10 YR 5/3)	Dark yellowish brown (10 YR 4/4)	Dark brown (7.5 YR 4/4)
Textural class	Silt loam	Silt loam	Silty clay loam	Silty clay loam
Consistence	Very friable	Very friable	Friable	Friable, slighly plastic when wet
Structure	Weak medium granular	Weak fine granular	Weak fine blocky	Moderate medium blocky
Bulk density	.94	1.32	1.44	1.49
pH	6.6	5.2	5.0	5.0
		Percent by weight		
Organic matter	4.05	.70	.55	.51
Mechanical composition				
Sand	9	4	4	4
Silt	80	80	61	63
Clay	11	16	35	33
		Percent by volume		
Plasticity constants				
Liquid limit	45	33	62	62
Plastic limit	35	32	33	36
Plasticity index	10	1	29	26
Total pore space	59	49	46	44
Moisture content				
1/3-atmosphere	20	23	36	39
15 atmospheres	9	8	20	21
Drainage capacity	39	26	10	5
Available water capacity	11	15	16	18

depth of the layer and totaling the resulting values for all layers.) If water were applied at a rate equal to the infiltration rate (0.55 inch per hour for this soil), the 6.8 inches could be safely added, without runoff, in 14 hours. The amount needed to bring the soil up to field capacity from any determined moisture content likewise could be estimated from these data.

The surface 6 inches of this soil reaches the wilting point in 25 days, while 40 days are required for the surface foot to reach this point.

Memphis Silt Loam, Eroded Phase

This loessial upland soil was near Vicksburg on a 15-percent slope under a moderate to poor stand of 15-year-old loblolly pine. Before the trees came in, the site had been pastured and cultivated, and erosion had removed about 10 to 12 inches, or all of the A horizon. Approximately one inch of A_1 has developed since the loblolly pine stabilized the soil (table 2). Organic matter of this surface layer was 4.56 percent as compared to 4.05 percent for the A_1 layer of the virgin Memphis.

The drainage capacity of the two surface layers is less than of the virgin Memphis. This is probably because the second layer of this soil has a blocky structure whereas the upper layers of the virgin Memphis are granular.

During the winter, when rain is frequent and there is little soil drying, this silt loam probably would not drain below 32 percent moisture by volume. Since this is above the plastic limit (30 percent by volume), the soil should not be worked or plowed in winter.

Below six inches this soil contains less clay than the other Memphis. This fact, plus the lower bulk density, probably accounts for the better aeration in the lower layers of this soil than in the virgin Memphis. The available water capacity, however, is nearly the same for the two soils.

Table 2. Memphis silt loam, eroded phase

Item	Soil layer		
	1	2	3
Depth	0 to 1 inches	1 to 6 inches	6 to 42 inches
Color	Pale brown (10 YR 6/2, dry)	Brownish yellow (10 YR 6/6, dry)	Yellowship brown (10 YR 4/4, dry)
Textural class	Silt loam	Silty clay loam	Silt loam
Consistence	Very friable	Friable, slightly plastic when wet	Friable, slightly plastic when wet
Structure	Fine granular	Weak fine blocky	Moderate medium blocky, with white silt coatings
Bulk density	1.21	1.32	1.37
pH	5.8	4.9	5.1
		Percent by weight	
Organic matter	4.56	.78	.35
Mechanical composition			
Sand	13	8	6
Silt	71	65	72
Clay	16	27	22
		Percent by volume	
Plasticity constants			
Liquid limit	53	46	49
Plastic limit	38	30	32
Plasticity index	15	16	17
Total pore space	54	50	48
Moisture content			
1/3-atmosphere	30	32	32
15 atmospheres	17	14	14
Drainage capacity	24	18	16
Available water capacity	13	18	18

Drying time is the same as for the virgin Memphis—25 days for the surface 6 inches and 40 days for the surface 12 inches.

Loring Silt Loam

The Loring profile was on gently sloping upland soil in the National Military Park at Vicksburg, and, like Memphis, was developed in deep loess. The vegetative cover was herbaceous. The surface 8 inches (table 3) is probably an old plow layer of mixed A and B horizon material.

This soil has a silt loam texture down to about 14 inches, where it becomes a silty clay loam. At 32 inches, it is slightly more compact and firm than in the upper layers. Except for this firmness and a higher content of organic matter, the Loring is very similar to the near-virgin Memphis. Available water capacity for 42 inches of soil is 6.9 inches for Loring and 6.8 inches for the near-virgin Memphis soil.

If water were applied at the infiltration rate of 0.40 inch per hour, the available water capacity would be satisfied in 17 hours. The depletion period is the same as for the Memphis soils.

Grenada Silt Loam

The Grenada soil was also in the National Military Park at Vicksburg, in the same field as the Loring. Like the Loring and Memphis, it is an upland soil, derived from loess parent material and occurring on flat topography. The vegetative cover at the sampling point was herbaceous.

The characteristic feature of Grenada soil is the hardpan that occurs at 24 inches (table 4). Drainage capacity declines sharply from 30 percent in the surface layer to near zero in the hardpan. The low drainage capacity of the pan is reflected in the infiltration rate, which is only 0.10 inch per hour.

If it is assumed that plant roots do not penetrate the hardpan appreciably, the available water capacity is 3.48 inches.

Table 3. Loring silt loam

Item	Soil layer 1	2	3	4
Depth	0 to 8 inches	8 to 14 inches	14 to 32 inches	32 to 48 inches
Color	Light yellowish brown (10 YR 6/4)	Brownish yellow (10 YR 6/6)	Strong brown (7.5 YR 5/8)	Very pale brown (10 YR 7/3), highly mottled with shades of gray & yellow
Textural class	Silt loam	Silt loam	Silty clay loam	Silty clay loam
Consistence	Very friable	Friable	Friable, slightly plastic when wet	Firm
Structure	Weak fine granular	Moderate to weak medium blocky	Moderate medium blocky	Very weak medium blocky
Bulk density	1.34	1.38	1.50	1.50
pH	5.8	6.0	5.8	6.0
		Percent by weight		
Organic matter	1.60	.46	.44	.38
Mechanical composition				
Sand	8	5	5	6
Silt	74	75	64	65
Clay	18	20	31	29
		Percent by volume		
Plasticity constants				
Liquid limit	43	39	60	54
Plastic limit	34	32	33	33
Plasticity index	9	7	27	21
Total pore space	50	48	43	43
Moisture content				
1/3-atmosphere	28	25	36	36
15 atmospheres	13	8	20	18
Drainage capacity	22	23	7	7
Available water capacity	15	17	16	18

Table 4. Grenada silt loam.

Item	Soil layer 1	2	3
Depth	0 to 4 inches	4 to 24 inches	24 to 44+ inches
Color	Light yellowish brown	Brownish yellow	Light gray, mottled with shades of brown & yellow
Textural class	Silt loam	Silty clay loam	Silty clay loam
Consistence	Friable	Friable	Very firm (compact)
Structure	Weak fine granular	Moderate medium blocky	Very weak medium blocky to massive
Bulk density	1.18	1.36	1.54
pH	5.4	5.2	5.5
		Percent by weight	
Organic matter	2.35	.62	.32
Mechanical composition			
Sand	6	5	3
Silt	71	61	66
Clay	23	34	31
		Percent by volume	
Plasticity constants			
Liquid limit	40	65	66
Plastic limit	28	31	35
Plasticity index	12	34	31
Total pore space	56	49	42
Moisture content			
1/3-atmosphere	26	37	42
15 atmospheres	14	22	20
Drainage capacity	30	12	0
Available water capacity	12	15	22

The plastic limit of the surface layer is 28 percent, which is very near the limit of drainage, or 1/3-atmosphere moisture-tension value.

Briensburg Silt Loam

The Briensburg soil was sampled near Vicksburg, on level to gently sloping land at the base of a slope bordered by a small stream. This soil, developed in colluvium from the surrounding loess hills, had a herbaceous cover. Two properties of Briensburg that vary from the expected are a high pH, 7.6 to 7.8 (table 5), and a low infiltration rate, 0.20 inch per hour.

The high pH is probably due to alkaline soil materials washed in from the surrounding loess hills, or to the relatively high water table at this location. The stream adjacent to this soil contains backwater from a lake that may be alkaline.

The infiltration rate, 0.20 inch per hour, was obtained during a period when the water table was within 4 feet of the surface. The physical properties of the surface layers indicate that the rate would be much higher under normal summer conditions, when the water table is 10 feet or more below the surface.

The texture is quite uniform throughout, averaging less than 5 percent sand, about 80 percent silt, and a little more than 15 percent clay. The slight profile differentiation of this soil accounts for the uniform texture throughout. Most of the other properties do not vary much from layer to layer.

Organic matter decreases only slightly with depth, so that this soil, which has less organic matter in the surface than most of the other soils, has more in the lower depths.

The moisture-depletion period for the surface 6 inches is 40 days and for the surface foot 55 days. These longer periods indicate that this soil could be

Table 5. Briensburg silt loam

Item	Soil layer			
	1	2	3	4
Depth	0 to 6 inches	6 to 12 inches	12 to 18 inches	18+
Color	Brown (10 YR 5/3)	Pale brown (10 YR 6/3), slightly mottled with shades of gray	Gray (10 YR 5/1), mottled with brown	Light gray (10 YR 7/2), mottled with shades of brown and yellow
Textural class	Silt loam	Silt loam	Silt loam	Silt loam
Consistence	Friable	Friable	Friable	Friable
Structure	Weak fine granular	Compound very weak angular blocky and moderate medium granular	Compound very weak angular blocky and moderate medium granular	Very weak angular blocky
Bulk density	1.27	1.31	1.34	1.40
pH	7.6	7.7	7.8	7.8
	Percent by weight			
Organic matter	1.55	1.45	1.29	.91
Mechanical composition				
Sand	0	4	6	2
Silt	84	79	78	81
Clay	16	17	16	17
	Percent by volume			
Plasticity constants				
Liquid limit	51	51	50	48
Plastic limit	36	34	34	35
Plasticity index	15	17	16	13
Total pore space	52	51	50	47
Moisture content				
1/3-atmosphere	32	34	34	32
15 atmospheres	13	13	12	11
Drainage capacity	20	17	16	15
Available water capacity	19	21	22	21

irrigated more economically than the upland loess Memphis and Loring soils.

Collins Silt Loam

Collins is a level to very gently sloping stream bottomland soil derived from loess washed in from surrounding hills. The sampling location was near Vicksburg, in an area that had been in cultivation and pasture.

The Collins properties described in table 6 are for a disturbed soil. Considerable fill material had been deposited on the area from a drainage ditch nearby. There is evidence of an artificially compacted layer about one foot deep. The increase in bulk density from 1.39 for the surface layer to 1.56 for the second layer, and a corresponding decrease in drainage capacity from 17 to 1 percent, mark this compacted zone.

The infiltration rate of 0.40 inch per hour is abnormally high in view of the compacted zone. However, the zone may not have been uniformly compact over the area, and possibly was not present at all at the point where infiltration was measured. The infiltration rate reflects a typical Collins profile—the pan is not typical. Other properties such as color, texture, organic matter, and plastic limits are characteristic of this series.

In organic matter, pH, and texture this soil is similar to the Briensburg. As in Briensburg, the high available water capacity is probably related to the high silt content. A similar relationship between silt content and available water capacity has been noted in other data secured by the Vicksburg Infiltration Project.

Drying periods in dry weather were of the same length as for the other low-lying soil, Briensburg. Plants would have moisture available for 15 days longer on these soils than on the upland loess soils. Where irrigation is not practiced, these extra 15 days will probably be the difference between failure and success for some crops in dry years.

Table 6. Collins silt loam.

Item	Soil layer 1	2	3	4
Depth	0 to 8 inches	8 to 16 inches	16 to 24 inches	24 to 42 inches
Color	Brown (10 YR 5/3)	Yellowish brown (10 YR 5/4), slightly mottled with gray and brown	Gray (10 YR 5/2), and yellow (10 YR 7/6) mottled	Light gray (10 YR 7/2), mottled wtih brown and gray
Textural class	Silt loam	Silt loam	Silt loam	Silt loam
Consistence	Friable	Firm	Slightly firm	Friable
Structure	Compound weak granular and medium subangular blocky	Very weak coarse subangular blocky	Weak moderate subangular blocky	Weak medium platy
Bulk density	1.39	1.56	1.52	1.43
pH	7.8	7.8	7.8	7.8
		Percent by weight		
Organic matter	1.71	1.00	1.00	.83
Mechanical composition				
Sand	5	3	3	4
Silt	78	78	72	74
Clay	17	19	25	22
		Percent by volume		
Plasticity constants				
Liquid limit	49	55	59	50
Plastic limit	39	40	38	33
Plasticity index	10	15	21	17
Total pore space	48	41	43	46
Moisture content				
1/3-atmosphere	31	40	41	34
15 atmospheres	10	14	18	16
Drainage capacity	17	1	2	12
Available water capacity	21	26	23	18

Commerce Silty Clay, Overwash Phase

The Commerce is a Mississippi River alluvial soil. The sampling location was near Vicksburg, in a field that had been in cultivation and pasture. Topography was level to very gently sloping.

This phase of Commerce has much more clay in the surface foot than normal Commerce, which tends to be silt loam and silty clay loam in texture (table 7). Associated with this higher clay content is a higher moisture content at 1/3- and 15-atmosphere tensions, and a low drainage capacity.

In the summer when this soil dries, large cracks form and permit ready entrance of water. In the winter the soil is wet, the cracks are closed, and drainage is slow. The winter infiltration rate is about 0.35 inch per hour.

The plastic limits indicate that the moisture content should be well below field capacity before this soil is tilled.

Thirty-five and 40 days are required for the surface 6- and 12-inch layers to reach the wilting point. Soil cracking is probably the cause of the small difference in time, the cracks permitting rapid exhaustion of the moisture in the second 6 inches.

Sharkey Clay

The samples of this soil were taken from a cotton field near Stoneville, Mississippi. The site was level to very gently sloping. The soil is derived from Mississippi River alluvium. Only the surface six inches was sampled (table 8). Underneath the sampled layer the soil is a dark gray to gray clay that is very sticky when wet, firm when moist, and very hard when dry. Structure of the deeper layers is moderate coarse blocky.

The high clay content, 80 percent by weight, is characteristic of this soil series. In determining moisture as a function of tension on fine-textured soils such as this, there is considerable

Table 7. Commerce silty clay, overwash phase

Item	Soil layer			
	1	2	3	4
Depth	0 to 6 inches	6 to 14 inches	14 to 38 inches	38+
Color	Dark grayish brown (10 YR 4/2), with faint mottles	Dark gray (10 YR 4/1)	Grayish brown (10 YR 5/2), mottled with gray, yellow, and brown	Grayish brown (10 YR 5/2), mottled with gray, yellow, and brown
Textural class	Silty clay	Silty clay	Silty clay loam	Clay
Consistence	Sticky	Sticky	Slightly sticky when wet	Sticky
Structure	Weak medium to fine granular	Moderate coarse angular blocky	Weak medium blocky	Very weak medium blocky
Bulk density	1.42	1.41	1.32	1.29
pH	7.0	6.8	7.8	7.7
	Percent by weight			
Organic matter	1.98	1.82	.93	.83
Mechanical composition				
Sand	5	6	6	11
Silt	50	49	57	34
Clay	45	45	37	55
	Percent by volume			
Plasticity constants				
Liquid limit	81	85	65	108
Plastic limit	37	35	32	39
Plasticity index	44	50	33	69
Total pore space	47	47	50	51
Moisture content				
1/3-atmosphere	43	48	48	49
15 atmospheres	29	31	22	36
Drainage capacity	4	0	2	2
Available water capacity	14	17	26	13

swelling with addition of water to the unconfined sample. Thus higher moisture values are obtained in the laboratory than are possible under field conditions.

Cracking is even more of a problem in this soil than in the Commerce. In the winter, when the soil is wet and swollen, drainage is practically nil; in summer, water can readily enter the cracks.

Bosket Sandy Loam

The Bosket soil is derived from Mississippi River alluvium. It is well drained and shows a very low degree of horizon differentiation. Samples were taken from a cotton field near Stoneville. Properties of the surface 8 inches, the only layer that was studied, are shown in table 8. Underlying layers of this soil are usually yellowish-brown silty clay loam or sandy clay loam of friable consistence, and exhibit a weakly developed blocky structure.

Table 8. Sharkey clay and Bosket sandy loam.

Item	Sharkey clay, layer 1	Bosket sandy loam, layer 1
Depth	0 to 6 inches	0 to 8 inches
Color	Very dark gray (10 YR 3/1)	Light brownish gray
Textural class	Clay	Sandy loam
Consistence	Plastic when wet	Very friable
Structure	Moderate medium to fine granular	Structureless—single grain
Bulk density	1.30	1.30
pH	5.9	6.1
	Percent by weight	
Organic matter	1.5	1.5
Mechanical composition		
Sand	1	60
Silt	19	31
Clay	80	9
	Percent by volume	
Plasticity constants		
Liquid limit	78	39
Plastic limit	47	16
Plasticity index	31	23
Total pore space	51	51
Moisture content		
1/3-atmosphere	81	39
15 atmospheres	44	8
Drainage capacity	0	12
Available water capacity	37	31

It is rather surprising that a soil of 60 percent sand would retain 39 percent by volume of water at 1/3-atmosphere tension. By the time 15 atmospheres is reached, 31 percent by volume of moisture has been released; this is unusually high for available water capacity of sandy loams. The ability to retain water may be due to the expanding-lattice type of clay mineral that is found in most Mississippi River alluvium.

Pachuta Clay Loam

The Pachuta soil is derived from calcareous clay in prairie areas within the Coastal Plain. The samples were obtained from a profile near Pachuta, Mississippi. Vegetative cover at time of sampling was herbaceous, but formerly the area had been in forest and then under cultivation. Layer number 3, from 11 to 14 inches depth, was not sampled.

Sand content in the surface layers of this soil (table 9) is higher than in the Sharkey and Commerce series. Even with 32 percent sand, the surface layer is sticky when wet and exhibits large cracks when dry.

The soil is plastic at moisture contents higher than 26 percent. A field capacity value of 33 percent indicates the inadvisability of working this soil except when it is relatively dry. A very high infiltration rate of 3.45 inches per hour is adequate proof that water entered the soil through cracks, or in planes of pre-existing cracks that had been loosely closed. The cracks extend deeper than 26 inches, or into the fifth layer.

Winter drainage capacity decreases rapidly with depth from 19 percent for the surface layer to 0 for the fifth layer. There are corresponding increases in available water capacity from 10 to 20 percent for the same depths.

The surface foot of this soil is acid even though lime concretions occur throughout the profile. The lower depths are alkaline, with a pH of 7.8. Soil-moisture depletion was similar to the Commerce soil.

Table 9. **Pachuta clay loam.**

Item	Soil layer			
	1	2	4	5
Depth	0 to 5 inches	5 to 11 inches	14 to 26 inches	26+ inches
Color	Dark gray faintly mottled with reddish yellow	Pale olive mottled with brownish yellow	Olive yellow coarsely mottled with light olive gray	Pale olive gray, faintly mottled with light olive gray
Textural class	Clay loam	Clay	Clay	Clay
Consistence	Sticky when wet	Sticky when wet	Very sticky when wet	Very sticky when wet
Structure	Strong coarse and medium blocky surface slakes down to fine granular	Medium coarse sub-angular blocky	Weak coarse sub-angular blocky	Coarse and medium sub-angular blocky
Bulk density	1.26	1.25	1.25	1.25
pH	5.6	6.0	7.8	7.8
	Percent by weight			
Organic matter	2.87	.83	.62	.59
Mechanical composition				
Sand	32	18	8	12
Silt	35	36	39	31
Clay	33	46	53	57
	Percent by volume			
Plasticity constants				
Liquid limit	62	85	90	108
Plastic limit	26	29	31	30
Plasticity index	36	56	59	78
Total pore space	52	53	53	53
Moisture content				
1/3-atmosphere	33	42	52	55
15 atmospheres	23	29	34	35
Drainage capactiy	19	11	1	0
Available water capacity	10	13	18	20

Savannah Sandy Loam

This soil has developed in Coastal Plain sands and clays and occurs on gently sloping uplands. Samples were taken from a cotton field near Columbus, Mississippi.

Only the surface properties (table 10) were determined for this soil, the 4-inch layer that was sampled being from horizon Ap material.

This surface layer was rather high in sand content and available water capacity. In this and other characteristics it was similar to the sandy loam Bosket soil. A finer textured layer of sandy clay loam is usually found underneath the surface layer.

Table 10. **Savannah sandy loam**

Item	Soil layer
	1
Depth	0 to 4 inches
Color	Very pale brown
Textural class	Sandy loam
Consistence	Friable
Structure	Structureless—single grain
Bulk density	1.30
pH	5.3
	Percent by weight
Organic matter	1.3
Mechanical composition	
Sand	63
Silt	24
Clay	13
	Percent by volume
Plasticity constants	
Liquid limit	38
Plastic limit	17
Plasticity index	21
Total pore space	51
Moisture content	
1/3-atmosphere	40
15 atmospheres	12
Drainage capacity	11
Available water capacity	28

Sawyer Silt Loam

The Sawyer samples were taken near Laurel, Mississippi, under miscellaneous herbaceous cover and a poorly stocked forest of mixed pine and hardwood. Past land use has been forest

Table 11. Sawyer silt loam.

Item	Soil layer					
	1	2	3	4	5	6
Depth	0 to 3 inches	3 to 7 inches	7 to 14 inches	14 to 24 inches	24 to 36 inches	36+ inches
Color	Grayish brown	Light yellowish brown	Yellow	Yellow, with medium mottles of reddish yellow	Yellow, with medium distinct mottles of yellowish brown	Red and light gray
Textural class	Silt loam	Silt loam	Silt loam	Silty clay loam	Loam	Clay
Consistence	Very friable	Very friable	Friable	Friable to firm	Friable	Sticky
Structure	Fine granular	Very weak fine granular	Weak medium fine subangular blocky	Strong coarse and medium subangular blocky	Weak medium subangular blocky	Massive
Bulk density	1.25	1.35	1.33	1.51	1.58	1.32
pH	5.6	5.2	5.0	5.2	5.2	4.9
				Percent by weight		
Organic matter	4.75	1.10	.83	.55	.42	.38
Mechanical composition						
Sand	30	26	21	18	30	22
Silt	60	59	54	52	45	30
Clay	10	15	25	30	25	48
				Percent by volume		
Plasticity constants						
Liquid limit	41	35	44	62	54	104
Plastic limit	35	27	25	33	28	33
Plasticity index	6	8	19	29	26	71
Total pore space	53	49	48	43	40	50
Moisture content						
1/3-atmosphere	24	22	28	36	33	41
15 atmospheres	10	7	11	17	14	24
Drainage capacity	29	27	20	7	7	9
Available water capacity	14	15	17	19	19	17

and pasture. The soil is derived from Coastal Plain sands and clays and occurs on gently sloping to rolling upland.

The Sawyer has five distinct horizons overlying a clay substratum at 36 inches (table 11). This is characteristic of the series; and the properties represent the most usual or modal profile conditions.

Organic matter decreases from 4.75 percent in the surface horizon to 0.42 percent in layer 5. The soil reaction is uniform throughout. Bulk density increases with depth from 1.25 for the surface layer to 1.58 for layer 5; layer 6, the substratum has a density of 1.32.

Total pore volume and drainage capacity decrease with depth until the substratum is reached, whereas the corresponding available water capacity increases.

An infiltration rate at 0.90 inch per hour for this soil is relatively high. It would take approximately 9 hours to apply enough water to satisfy the available water capacity to a depth of 42 inches.

Only 30 days were required to deplete the surface 6-inch layer of available moisture, and an additional 5 days for the surface 12 inches.

Stough Silt Loam

The Stough soil was near Ellisville, Mississippi, in a wooded pasture. Vegetation consisted of widely scattered post oak, pine, and brush. Minor vegetation was sparse miscellaneous grasses and weeds.

The soil is old alluvium from Coastal Plain sands and clays, and occurs on a nearly level, old stream terrace. Characteristics are presented in table 12. A 2-inch layer that occurred at 5 to 7 inches depth was not sampled.

In the field this soil feels much like a very fine sandy loam, but the particle size distribution curve reveals that it is coarse silt. The Coastal Plain soils differ from the loess-derived silt loams in having a higher percentage of sand and less silt. This probably accounts for the slightly smaller available water capacity of the Coastal Plain soils.

Organic matter of Stough is 5.18 percent in the A_1 layer but decreases sharply to 0.83 and 0.62 percent in the lower layers.

The third and fourth layers resemble each other, except for consistence and color. Layer 4 is a compacted and weakly cemented fragi-pan, whereas layer 3 is friable. This weak pan, with a 15-percent drainage capacity, apparently does not reduce the infiltration rate, which for this soil was 0.55 inch per hour. The soil-moisture depletion characteristics are similar to those of Sawyer.

Wahee Silt Loam

The Wahee soil was also in a woodland pasture near Ellisville. There was a sparse cover of post oak, small pine, oak brush, and miscellaneous weeds and grasses. The soil is old alluvium from Coastal Plain sands and clays; it occurs on a nearly level to undulating old stream terrace.

The surface 8 inches (table 13) is the only material examined that did not exhibit some degree of plasticity, yet the textural class was silt loam. This soil would not puddle even if it were tilled immediately after rainfall. The wilting point of the surface layers is lower than in the corresponding layers of other soils.

Drainage capacity decreases from 32 percent in the surface layer to 5 percent in the fourth; it then increases to 15 percent in the 24-to 30-inch layer. and decreases sharply to zero at 30 inches depth. At this depth the soil is very compact, bulk density being 1.71.

Available water capacity increased from the surface downward through the third layer, then decreased slightly in the fourth and fifth layers, and fially increased in the sixth, or deepest, layer.

Infiltration rate was 0.55 inch per hour, the same as for Stough, the other old terrace soil. Moisture-depletion properties were also similar to those of Stough.

Table 12. Stough silt loam

Item	Soil layer 1	Soil layer 3	Soil layer 4
Depth	0 to 5 inches	7 to 15 inches	15 to 43 inches
Color	Dark grayish brown	Yellow, highly mottled with yellowish brown	Light gray, faintly mottled with yellowish brown
Textural class	Silt loam	Silt loam	Silt loam
Consistence	Very friable	Friable	Compacted and weakly cemented
Structure	Fine granular	Weak coarse subangular blocky	Coarse subangular blocky
Bulk density	1.11	1.51	1.56
pH	5.4	5.0	5.0
		Percent by weight	
Organic matter	5.18	.83	.62
Mechanical composition			
Sand	35	30	31
Silt	57	56	52
Clay	8	14	17
		Percent by volume	
Plasticity constants			
Liquid limit	36	35	42
Plastic limit	30	26	25
Plasticity index	6	9	17
Total pore space	58	43	41
Moisture content			
1/3-atmosphere	22	24	26
15 atmospheres	9	8	9
Drainage capacity	36	19	15
Available water capacity	13	16	17

Table 13. Wahee silt loam

Item	Soil layer 1	2	3	4	5	6
Depth	0 to 3 inches	3 to 8 inches	8 to 14 inches	14 to 24 inches	24 to 30 inches	30+
Color	Grayish brown	Very pale brown faintly mottled with yellowish brown	Yellow, with distinct fine mottles of yellowish brown	Pale brown, with distinct fine and medium mottles of yellowish brown	Light brownish gray, distinctly mottled with brownish yellow	Light brownish gray, mottled with brownish yellow
Textural class	Silt loam	Silt loam	Silt loam	Silty clay loam	Silt loam	Loam
Consistence	Very friable	Very friable	Friable	Firm	Friable to firm	Very friable
Structure	Weak fine granular	Weak very fine granular with few soft dark concretions	Weak medum and fine subangular blocky	Strong coarse. medium and fine subangular blocky	Weak medium subangular blocky, numerous small iron concretions, and small pockets of silty clay	Weak subangular blocky with numerous small pockets of sandy clay
Bulk density	1.25	1.43	1.57	1.55	1.45	1.71
pH	5.5	5.2	5.1	5.3	5.3	5.0
				Percent by weight		
Organic matter	3.32	1.60	.62	.46	.42	.35
Mechanical composition						
Sand	32	32	29	19	22	31
Silt	61	63	60	50	52	45
Clay	7	5	11	31	26	24
				Percent by volume		
Plasticity constants						
Liquid limit	nonplastic	nonplastic	30	62	59	55
Plastic limit	nonplastic	nonplastic	27	34	26	27
Plasticity index	nonplastic	nonplastic	3	28	33	28
Total pore space	53	46	41	42	45	36
Moisture content						
1/3-atmosphere	21	21	25	37	30	36
15 atmospheres	6	3	3	19	16	17
Drainage capacity	32	25	16	5	15	0
Available water capacity	15	18	22	18	14	19

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M69.b
no 522

BULLETIN 522 JUNE 1954

An Economic Appraisal of
HOG PRODUCTION
In The Brown Loam Area of Mississippi

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ACKNOWLEDGEMENTS

This is one of a series of studies dealing with the economics of livestock production on Mississippi farms. Other studies include broilers, laying flocks, milk production, beef production, and sheep production.

Appreciation is extended to Dr. R. J. Saville, Head, Department of Agricultural Economics; Mr. J. L. Fletcher, Associate Professor of Animal Husbandry; and Mr. W. L. Richmond, Assistant Extension Animal Husbandman for suggestions in organization and development of the study. Dr. Saville, Mr. Richmond, and Mr. C. B. Shawver read the manuscript and gave many helpful suggestions. Dr. L. N. Wise, Professor of Agronomy; Dr. W. L. Giles, Superintendent, Delta Branch Station; Dr. W. B. Andrews, Professor of Soils; and Mr. W. R. Thompson, Extension Agronomist, gave many helpful suggestions relating to methods of calculating pasture costs and of presenting pasture data.

AN ECONOMIC APPRAISAL OF HOG PRODUCTION IN THE BROWN LOAM AREA OF MISSISSIPPI

By D. W. PARVIN and J. D. JONES

The Problem. Although hogs rank fourth among livestock as a source of income in Mississippi,[1] pork production is a major enterprise on many farms. In 1952, Mississippi producers received 22 million dollars from the sale of hogs. Relatively low investment and labor requirements make the pork enterprise attractive on many farms where soils are favorable for production of relatively large amounts of corn compared to pasture and forage crops.

It is expected that production of corn in Mississippi will increase because per acre yields on much land used for corn are below those that can be profitably produced by the use of practices developed by Experiment Station agronomists; also, the total acres of corn will likely increase as a result of the Government program which restricts cotton acreage. A continuation of economic activity at not much below the present level and an increase in population should result in the demand for meat continuing to be relatively high. Therefore, sale of hogs should continue to be a major source of income on many Mississippi farms. Relatively inexperienced hog producers, and those contemplating adding a hog enterprise to their present farming system, need basic information on which to base their decisions. This study was designed to provide such information, particularly the following:

1. Resources used in hog production and investment required.
2. Costs and returns.
3. Present management practices and ways by which hog production can be made more profitable.

Method of study. Yazoo County was the area selected for study because of the concentration of commercial producers. A list of hog producers was secured from the Agricultural Extension Service and supplemented by agricultural workers in the county. Data for the study were obtained by personal interviews with producers. Insofar as possible, all commercial producers were interviewed.[2] The period covered in this study was from July 1, 1950 to June 30, 1952. Separate interviews were made during the summer months in 1951 and 1952, respectively. Detailed information with regard to all phases of the hog enterprise was obtained from 37 producers. Methods used in calculating investment, costs and returns are given in Appendix I.

System of Farming

Land use. Farms producing hogs commercially were about three times as large as the average operating unit in the area studied, 622 acres compared to 213 acres[3] (Appendix Table 1). On the farms studied, 80 percent of the land operated was owned and 20 percent rented. Of the acreage operated, 28 percent was classified as cropland, 14 percent as open permanent pasture, 46 percent as woodland pasture and 10 percent as woodland not pastured.

Cropping pattern. Forty-four percent of the cropland was planted to corn and 26 percent to cotton (Appendix Table 2). Soybeans, oats and hay were the other important crops grown. Six percent of the cropland was idle.

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[1] The Farm Income Situation, July-August, 1953, United States Department of Agriculture.

[2] Producers selling 10 or more hogs annually. Producers who were not able to give complete information, those not producing hogs commercially each of the years studied and those from whom interviews were not obtained after three visits to the farm were dropped from the study.

[3] White owner operators only; United States Census of Agriculture, Mississippi, 1950.

Livestock system. The producers included in the study had been in commercial hog production an average of 11 years. Commercial livestock production was limited to production of hogs on 54 percent of the farms. Beef cattle were produced commercially on 43 percent of the farms studied, sheep on 8 percent, goats on 5 percent, and dairy cattle on 3 percent (Appendix Table 3).

There was an average of 8.4 sows per farm and 74 hogs were sold annually per farm (Appendix Table 11). In addition, for all farms studied, an average of 20 beef animals were sold annually, 3 cows milked and 42 laying hens kept per farm.

Farm labor supply. Including the operator, there was an average of 3.6 persons in the family labor force per farm (Appendix Table 4). There were the same number of males and females and about 60 percent of the family labor force was between the ages of 18 and 60. Five of the 37 operators were under 30 years of age and 6 over 60 years of age (Appendix Table 5).

Farm power. Tractors were used as a source of power on 34 of the 37 farms. There was an average of 1.5 tractors per farm for those farms having tractors. Eighty-two percent of the tractors were classified as two-row tractors.

Farm buildings. The general barn was used in connection with the hog enterprise on 29 of the 37 farms studied (Appendix Table 8). A general hog barn was used on 6 farms. Cribs or grain storage facilities, separate from the general barn or general hog barn, were used on 14 farms. Individual farrowing houses were used on two farms and a central farrowing house on four farms.

Management Practices

Feeding practices. Practically all of the feed consumed by the hogs (96 percent) was produced on the farm (Appendix Table 17). Seventy-seven percent of the average hog ration was corn, 13 percent soybeans, and 6 percent oats. About 57 percent of the corn, 99 percent of the soybeans, and 93 percent of the oats were hogged off. When corn and/or soybeans were hogged off, the animals were usually turned in the field when corn was in the early dent stage and soybeans were fully developed but still containing some greenness. The oats hogged down were those oats that were allowed to mature on fields that had also been used for temporary winter grazing. Purchased protein supplement (cottonseed meal, soybean meal, tankage, fish meal and commercial supplement) accounted for 3 percent of the total ration. All high protein feed (soybeans and purchased protein supplement) accounted for 16 percent of the total ration. A total of 498 pounds of feed was consumed for each 100 pounds of pork produced.

Grazing practices. The acreage of pasture used by the hog enterprise was relatively large. A total of 1.6 acres of permanent pasture, 2.0 acres of wood land pasture and .7 acres of temporary winter pasture was used per sow and litter or litters (Appendix Table 18).

Most of the open permanent pasture used by hogs was unimproved. Approximately one-fifth of the acreage had been fertilized and about one-fifth had been seeded. Nitrogen and phosphate were the fertilizers commonly used. White Dutch clover, fescue, red clover, and Dallis grass were the pasture plants most often seeded.

Temporary winter pasture grazed by hogs represented a relatively small percentage of the total acres used; however, these pastures received much more attention than permanent pastures. Most of the temporary winter pasture was broken, seeded and fertilized. Nitrogen, phosphate and potash were the fertilizer elements used most often. Oats alone or in combination with a legume such as red clover was the winter pasture most commonly used. In addition to the grazing obtained, oats were allowed to mature on most farms having temporary winter pastures and were harvested or hogged off. About 150 bushels of oats were harvested or hogged off per farm from the 5.7 acres of temporary winter pasture used by the hog enterprise.

Water for the hog enterprise was supplied by ponds, creeks, wells, and springs (Appendix Table 20). Ponds were used on 23 farms, creeks on 11 farms, wells on 2 farms and springs on 1 farm. Ten of the 37 farms had two sources of water.

Breeding practices. Ninety-five percent of all producers used boars that were purebred and 46 percent used registered boars. Only 10 percent of the farms studied had registered sows and gilts. There was an average of nine sows per boar.

Pigs were farrowed each month in the year, with some concentration in the spring and fall. Thirty-one percent of the pigs were farrowed in March, April, and May and 38 percent in August, September, and October; 31 percent were farrowed in the other six months (Appendix Table 12). On most farms, two litters per sow were farrowed each year. An average of 4.3 pigs were raised per litter.

Buying and selling hogs. The annual production of pork averaged 13,793 pounds per farm or 1,632 pounds per sow (Appendix Table 16). Hogs other than sows, boars, and pigs, accounted for 92 percent of the pounds of pork sold (Appendix Table 15). Hogs other than sows, boars, and pigs, were sold at an average weight of 190 pounds. Some hogs were sold each month in the year; however, there was a concentration of sales in the fall and winter months. Forty-six percent of the hogs, other than sows, boars and pigs, were sold in the fall months of September, October, and November; an additional 29 percent was sold in December, January, and February (Appendix Table 12). An average of 18 feeder hogs and 7 feeder pigs were purchased annually per farm.[4] Purchases of feeder hogs and feeder pigs were concentrated in the late summer and early fall, although some were purchased in every month except May.

Health practices. Hogs were vaccinated for cholera on 86 percent of the farms, vaccinated for septicemia on 19 percent of the farms, treated for internal parasites on 68 percent of the farms and treated for external parasites on 89 percent of the farms.

Approximately 5 percent of the sows and bred gilts aborted. Death losses for sows amounted to about 6 percent of the average number on hand. Death losses for pigs averaged 19.3 percent of the total number born and purchased. Death losses for hogs, other than sows, boars, and pigs, amounted to 6.6 percent of the number produced.[5]

Of the total number of pigs dying, sows killed 65 percent; freezing, starving and drowning, 5 percent; parasites and diseases, 14 percent; unknown causes, 14 percent; and other causes, 2 percent. Of the total number of hogs (other than sows, boars, and pigs) dying, parasites and diseases killed 78 percent, unknown causes, 17 percent, and other causes, 5 percent. Perhaps parasites and diseases accounted for some of the deaths, the cause of which was listed as unknown. **Actinomyces necrophorus,** commonly called "Necro," accounted for about one-half of the deaths caused by parasites and diseases. Cholera, screwworms and septicemia accounted for practically all of the remaining deaths due to parasites and

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[4] Hogs purchased were classified as feeder hogs if they weighed 50 pounds or more and feeder pigs if they weighed less than 50 pounds.

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[5] Hogs sold plus hogs killed for home use plus increase in hog numbers (change in inventory) divided into hogs dying.

diseases. In addition to the number of animals lost, parasites and diseases reduced the efficiency with which gains were made on animals that recovered.

Labor utilization. Labor used for the hog enterprise averaged 373 hours per farm, 44 hours per sow, and 2.7 hours per 100 pounds of pork produced (Appendix Table 6). There was relatively little variation in the amount of labor used on the hog enterprise during the different seasons of the years.

Investment, Cost and Returns

Investment. Investment in the hog enterprise includes investment in the breeding herd, pasture land (including fences) and buildings. Investment in these three items averaged $1,749 per farm, $207 per sow and $12.68 per 100 pounds of pork produced (Table 1).

The investment in breeding animals amounted to $415 per farm or 24 percent of the total investment in the hog enterprise. Investment in breeding animals averaged $49 per sow, of which $44 was the value of the sow; the remaining $5 was the sow's share of the investment in boars.

Almost 60 percent of the total investment in the hog enterprise was in pasture land. This amounted to $1,019 per farm and $121.00 per sow. Open permanent pasture accounted for about two-thirds of the investment in pasture land.

Buildings used by the hog enterprise accounted for 18 percent of the total investment in the enterprise. The total investment in buildings averaged $315 per farm and $37 per sow. The portion of the general barn used by or for the hog enterprise accounted for more than one-half of the investment in buildings.

Costs. Costs as calculated in this study included charges for feed, pasture, labor, buildings, marketing, interest on investment in sows and boars and miscellaneous items. A charge for interest on investment was included as a part of the cost of pastures and buildings. The annual cost of the hog enterprise averaged $2,560 per farm, $303 per sow and $18.56 per 100 pounds of pork produced (Table 2).

Table 1. Investment in the hog enterprise, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Per farm	Per sow	Per 100 pounds of pork produced
		Dollars	
Breeding herd:			
Sows	373	44	2.70
Boars	42	5	.30
Total	415	49	3.00
Pasture land :			
Open permanent	673	80	4.88
Woodland	86	10	.62
Temporary winter	260	31	1.89
Total	1,019	121	7.39
Buildings:			
General barn	181	21	1.31
General hog barn	38	5	.28
Cribs and other grain storage	83	10	.60
Central farrowing house	12	1	.09
Other	1	[1]	.01
Total	315	37	2.29
Total investment	1,749	207	12.68

[1] Less than $0.50.

Table 2. Annual cost of the hog enterprise, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Per farm	Per sow	Per 100 pounds of pork produced
		Dollars	
Feed	1,817	215	13.17
Pasture	275	33	2.00
Labor	152	18	1.10
Building	60	7	.43
Marketing	62	7	.45
Interest on sows and boars	21	2	.15
Miscellaneous	173	21	1.26
Total	2,560	303	18.56

The cost of purchased feed, plus the value of home-grown feed accounted for 71 percent of the cost of the hog enterprise. Feed cost averaged $1,817 per farm, $215 per sow and $13.17 per 100 pounds of pork produced. The value of corn fed constituted 68 percent of the total cost of feed; soybeans accounted for 17 percent of the balance. Purchased feed represented only 8 percent of the total cost of feed.

The annual cost of pastures used by hogs amounted to $275 per farm, $33 per sow and $2.00 per 100 pounds of pork produced. This was 10.7 percent of the cost of the enterprise. Temporary winter pasture accounted for 64 percent of total pasture cost. Improved permanent pastures accounted for another 30 percent. Although the total cost of pastures was relatively high, pasture credits (the value of oat grain harvested or hogged down from temporary winter pasture) reduced the net cost of grazing to about one-half of the total cost of pastures.

The annual cost of labor used on the hog enterprise averaged $152 per farm, $18 per sow and $1.10 per 100 pounds of pork produced. This was 5.9 percent of total cost.

Building cost, marketing charges and interest on investment in sows and boars were minor items of cost as compared to feed, pasture and labor. Building cost accounted for 2.3 percent of the annual cost of the hog enterprise, marketing charges for 2.4 percent and interest on investment in sows and boars for .8 percent.

Miscellaneous cost items such as veterinary fees and medicine, fencing costs for corn and soybeans hogged down, auto expense, taxes, salt and minerals amounted to $173 per farm, $21 per sow and $1.26 per 100 pounds of pork produced. These items accounted for 6.7 percent of the total cost of the enterprise.

Returns. Total annual returns averaged $2,709 per farm, $320 per sow and $19.64 per 100 pounds of pork produced (Table 3). The value of animals produced accounted for 95 percent of total returns and pasture credits for 5 percent.

The difference between total returns and costs, as calculated in this study, represents the net returns to the operator for management of the enterprise. Annual returns to management averaged $149 per farm, $17 per sow and $1.08 per 100 pounds of pork produced. When labor is not deducted as a cost, the difference between total returns and costs represents the returns to the operator for labor used in taking care of the enterprise and for management. Annual returns to labor and management averaged $301 per farm, $35 per sow, $2.18 per 100 pounds of pork produced and $0.81 per hour of labor used.

A part of the returns to labor and man-

Table 3. Annual returns to the hog enterprise, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Per farm	Per sow	Per 100 pounds of pork produced
		Dollars	
Value of pork produced	2,564	303	18.59
Pasture credits	145	17	1.05
Breeding fees	[1]	[1]	[2]
Total return	2,709	320	19.64
Less costs	2,560	303	18.56
Returns to management	149	17	1.08
Plus value of labor	152	18	1.10
Returns to labor and management[3]	301	35	2.18

[1] Less than $0.50.

[2] Less than .5 cents.

[3] Returns to labor and management per hour of labor used averaged $0.81.

agement was due to the higher than average corn-hog ratio that existed in Mississippi during the period studied. At that time the corn-hog ratio for Mississippi was 12.97 compared to 12.42 for the 5-year period beginning July 1947 and ending June 1952, and 10.68 for the 10-year period beginning July 1943 and ending June 1953 (Appendix Table 27). If corn had been priced at its July 1947-June 1952 level in relation to the price of pork, cost would have been increased $51 per farm, $6 per sow and $0.37 per 100 pounds of pork produced; and returns to labor and management would have been reduced to $250 per farm, $30 per sow, $1.81 per 100 pounds of pork produced and $0.67 per hour of labor used. If corn had been priced at its July 1943-June 1953 level in relation to the price of pork, cost would have been increased $262 per farm, $31 per sow and $1.90 per 100 pounds of pork produced; and returns to labor and management would have been reduced to $39 per farm. $5 per sow, $0.28 per 100 pounds of pork produced and $0.10 per hour of labor used.

Conclusions

This study indicates that returns to the hog enterprise in this area will be relatively low in the future if present practices are continued and the corn-hog ratio drops to the average level that prevailed from 1943 to 1953.

High death losses, reduced efficiency for animals recovering from parasites and diseases, and uncontrolled breeding appear to be the major weaknesses in the present system of production.

The number of animals infected by parasites and diseases, and death losses can be reduced by utilizing good health and sanitation practices such as the rotation of pastures, vaccinating for cholera and treating for internal and external parasites and by taking better care of animals during the farrowing season.

The concentration of farrowing in the early spring and in the early fall will increase the efficiency of handling and of production and will permit the concentration of sales in those months when prices are normally highest.

The feeding program, from the standpoint of the amount of high protein feed in relation to the amount of grain, appeared to be satisfactory. The amount of forage available for hogs seemed to be adequate; however, the cost of forage could perhaps be reduced by improving more of the open permanent pasture and by reducing the acreage of unimproved open permanent pasture and woodland pasture.

Improvement in the quality of slaughter animals sold through the use of better boars and sows and marketing in good conditions at about 225 pounds in weight should result in increased efficiency and higher profits.

APPENDIX I

Methods Used in Calculating Investment, Costs and Returns

A. Investment.

1. **Breeding Stock:** The average number of each class of hogs was calculated from the number on hand at the beginning and at the end of the year. Investment in the breeding stock was determined from the average number of each class of animals and producer estimates of the value of each class at the end of the year. An allowance was made on each farm for changes in weight of each class of animal.

2. **Land.** Acreage of pasture land used by hogs was calculated by prorating the total acreage, on the basis of grazing secured between hogs and other livestock. Investment in pasture land was based on the number of acres used by hogs and producer estimates of value per acre which included the value of fences. Only one-half of the value of land double-cropped was included in the investment. Woodland pasture was valued for grazing purposes only.

3. **Buildings:** It was assumed that the average investment in buildings would approximate one-half of the replacement cost. Investment in buildings was based on this assumption and on producer estimates of replacement cost. Investment in buildings used jointly with other livestock was prorated on the basis of the proportion used for the hog enterprise.

B. Costs.

1. **Feed:** Feed cost was based on producer estimates of quantities fed and the average price of each kind of feed. The price used for home-grown feeds was the price paid farmers during the harvest season.

2. **Pasture:** Pasture cost was based on the acreage used by the hog enterprise and the annual cost per acre of pasture. In calculating pasture costs, labor cost was calculated at the prevailing wage rate of 40 cents per hour; machinery cost was based on farm management cost studies; fencing cost was based on producer estimates as to the materials, labor and equipment used and prevailing prices; and seed and fertilizer costs were calculated by using average prices for the year studied and producer information as to the quantities used.

In calculating the total cost of improved permanent pasture, the total cost of improvements made was calculated on the basis of July 1950-June 1952 prices regardless of the year in which the improvements were made. Because of wide differences in P.M.A. payment rates in different years and different counties, no deduction from total pasture cost was made for these payments.

Upon the recommendations of agronomists the annual charges for seed, fertilizer, and land preparation for improved permanent pasture were calculated as follows: (1) seed, one-tenth of the total cost; (2) land preparation except applying fertilizer, one-tenth of the total cost; and (3) cost of fertilizer and its application was calculated as follows: the total cost of nitrogen was charged to the year applied; 40 percent of the total cost of phosphate, potash and basic slag was charged to the year applied, 40 percent to the following year and 20 percent to the third year; and 20 percent of the total cost of lime was charged to each of the first four years after its application, 10 percent to the fifth year and 10 percent to the sixth year. In addition, the annual cost of improved permanent pasture included mowing, fencing and interest on investment. Interest on investment was computed at 5 percent of the average investment in land and fences.

3. **Buildings:** Building cost included depreciation, repairs and interest on investment. The annual charge for depreciation was calculated by the straight-line method, charges for repairs were based on farm management cost studies and were calculated at 3 percent of replacement cost. Interest on investment was computed at 5 percent of one-half the replacement cost of buildings.

4. **Labor:** Labor cost was based on producer estimates of time spent on the hog enterprise and the prevailing wage rate.

5. **Marketing.** Marketing cost was based on producer information as to commission fees and other marketing cost.

6. **Interest on Investment in Sows and Boars:** Interest on investment in sows and boars was computed at 5 percent of the average investment in those animals.

7. **Miscellaneous:** Miscellaneous cost was based on producer information as to these costs or as to the quantities of miscellaneous items used and the average price of these items.

C. **Receipts.**

1. **Pork Production:** Receipts from the production of pork were calculated by adding the value of animals sold, animals killed for food and inventory changes and subtracting the value of animals purchased. In calculating the value of inventory changes, increases or decreases in inventory were valued at prices per pound prevailing at the end of the year.

2. **Pasture Credits:** Pasture credits were based on producer estimates as to the quantity of hay and seeds harvested from pasture land charged to the hog enterprise and prevailing prices for these items. The average price received for these items was discounted by an amount equal to the cost of harvesting.

APPENDIX II

Table 1. Land use, 37 farms having hog enterprises, Southern Brown Loam, July 1950-June 1952.

Item	Acres per farm	Percent of acres operated
Owned	499	80.2
Rented in	123	19.8
Operated	622	100.0
Cropland	173	27.8
Open permanent pasture	88	14.2
Woodland pasture	288	46.3
Woodland	64	10.3
Farmstead and other	9	1.4

Table 2. Cropland utilization, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Acres per farm	Percent of total
Cotton	45	26.0
Corn	76	43.9
Oats	10	5.8
Hay	9	5.2
Soybeans	15	8.7
Other crops	8	4.6
Idle cropland	10	5.8
Total	173	100.0

Table 3. Other livestock enterprises of commercial importance, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Enterprise	Number of farms having	Percent of farms having	Average number of specified animals per farm having
Dairy[1]	1	2.7	10
Poultry, eggs[2]	0	0	---
Beef[3]	16	43.2	27
Sheep[4]	3	8.1	15
Goats[5]	2	5.4	52
Farms having at least one other enterprise[6]	17	45.9	

[1] Farms having 10 or more milk cows. The number of milk cows for all farms averaged 2.8.

[2] Farms having 200 or more hens. The number of hens for all farms averaged 42.

[3] Farms selling 10 or more beef animals. The number of beef animals sold by all farms averaged 19.5.

[4] Farms selling 10 or more sheep.

[5] Farms selling 10 or more goats.

[6] Of commercial importance in addition to hogs.

Table 4. Age and sex distribution of family labor force, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.[1]

Age group	Number per farm		
	Males	Females	Total
Below 9	.35	.43	.78
9-12	.08	-----	.08
13-17	.03	.19	.22
18-59	1.13	1.08	2.21
60-69	.14	.08	.22
70 and above	.05	-----	.05
Total	1.78	1.78	3.56

[1] In addition an average of 50 days of wage labor was hired annually per farm of which 95 percent was hired by the month.

Table 5. Age of operator, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Age group	Number of operators	Percent of operators
20-29	5	13.5
30-39	9	24.3
40-49	15	40.6
50-59	2	5.4
60-69	4	10.8
70-79	2	5.4
Total	37	100.0

Table 6. Hours of labor used annually for the hog enterprise per farm, per sow, and per 100 pounds of pork produced, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Month	Per farm	Per sow	Per 100 pounds of pork produced
January	32.5	3.85	.24
February	29.0	3.43	.21
March	31.0	3.67	.22
April	30.0	3.55	.22
May	31.0	3.67	.22
June	30.5	3.61	.22
July	31.5	3.73	.23
August	32.5	3.85	.24
September	30.5	3.61	.22
October	31.0	3.67	.22
November	31.0	3.67	.22
December	32.5	3.85	.24
Total	373.0	44.14	2.70

Table 7. Annual labor cost for the hog enterprise per farm, per sow and per 100 pounds of pork produced, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Hours	Cost
		Dollars
Labor per farm	373.00	152.08
Labor per sow	44.14	18.00
Labor per 100 pounds of pork produced	2.70	1.10

Table 8. Number of buildings used in connection with the hog enterprise, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Type building	Number of farms having	Percent of farms having
General barn	29	78
General hog barn	6	16
Crib or grain storage	14	38
Central farrowing house	4	11
Individual farrowing house	2	5
Total	37	100

Table 9. Replacement cost of buildings used in connection with hog enterprise, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Replacement cost per building	Replacement cost per farm	Replacement cost to hogs
		Dollars	
General barn	1,544	1,140	363
General hog barn	570	86	76
Crib or grain storage	721	244	165
Central farrowing house	220	24	24
Individual farrowing house	68	2	2
Total		1,496	630

Table 10. Annual building cost for the hog enterprise per farm, per sow, and per 100 pounds of pork produced, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Per farm	Per sow	Per 100 pounds of pork produced
		Dollars	
Depreciation	25.18	2.98	.18
Repair	18.88	2.24	.14
Interest	15.75	1.86	.11
Total	59.81	7.08	.43

Table 11. Hog numbers per farm, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Ave. of beginning inventories	Born annually	Purchased annually	Used in home annually	Sold annually	Died annually	Ave. of ending inventories
Sows[1]	8.2		.8	.1	3.5	.5	8.7
Boars	.9		.2		.2		.9
Pigs (under 50 pounds)	18.4	81.3	7.4		.8	17.1	23.3
Other hogs	30.7		18.4	3.1	69.1	5.0	34.0
Total	58.2	81.3	26.8	3.2	73.6	22.6	66.9

[1] Includes bred gilts.

Table 12. Percentage of pigs born, pigs purchased, feeder hogs purchased and hogs sold, by months, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Month	Pigs born	Pigs purchased	Feeder hogs purchased	Hogs sold[1]
January	5	7	2	7
February	8	17	6	13
March	11	1	3	6
April	10	4	3	4
May	10	0	0	1
June	5	17	7	6
July	5	8	8	1
August	10	17	29	7
September	19	6	9	11
October	9	5	16	14
November	5	10	5	21
December	3	8	12	9
Total	100	100	100	100

[1] Other than sows, boars, and pigs.

Table 13. Health practices, 37 farms having hog enterprises, Southern Brown Loam, July 1950-June 1952.

Item	Number of farms	Percent of farms
Vaccinating for cholera	32	86.5
Vaccinating for septicemia	7	18.9
Treating for internal parasites	25	67.6
Treating for external parasites	33	89.2

Table 14. Cause of death of animals, 37 farms having hog enterprises, Southern Brown Loam, July 1950-June 1950.

Item	Sows and bred gilts	Pigs	Hogs
		Percentage of total	
Killed by sow	—	65	—
Frozen, starved or drowned	4	5	—
Unknown	47	14	17
Parasites and diseases[1]	38	14	78
Other	11	2	5
Total	100	100	100

[1] Primarily actinomyces necrophorus "Necro," cholera, screwworms, and septicemia.

Table 15. Pounds and value of pork sold annually per farm, 37 farms having hog enterprises, Southern Brown Loam, July 1950-June 1952.

Item	Liveweight	Value	Price per cwt.
	Pounds	Dollars	Dollars
Sows	1,013	165.75	16.36
Boars	138	16.11	11.67
Pigs (under 50 pounds)	23	5.52	24.00
Other hogs	13,138	2,451.56	18.66
Total	14,312	2,638.94	18.44

Table 16. Pounds and value of pork produced annually per farm and per sow, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Liveweight		Value	
	Per farm	Per sow	Per farm	Per sow
	Pounds	Pounds	Dollars	Dollars
Sales	14,312	1,694	2,638.94	312.29
Plus amount used in home	758	90	137.80	16.31
Plus increase in inventory	833	98	165.00	19.53
Minus purchases	2,110	250	377.76	44.70
Total production	13,793	1,632	2,563.98	303.43
Value of pork produced per 100 pounds				18.59

Table 17. Quantities and value of feed used annually by the hog enterprise per farm, per sow and per 100 pounds of pork produced, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Quantity	Cost
	Pounds	Dollars
Corn[1]	53,163	1,234.29
Soybeans[1]	8,869	306.95
Oats[1]	4,146	123.63
Cottonseed meal	23	1.02
Soybean meal	34	1.44
Tankage and fish meal	187	11.97
Commercial supplement	1,875	119.79
Wheat shorts	123	5.28
Pig and sow ration	200	10.57
Other	41	1.74
Total per farm	68,661	1,816.68
Total per sow	8,125	214.99
Total per 100 pounds of pork produced	498	13.17

[1] Fifty-seven percent of the corn was hogged off, 99 percent of the soybeans, and 93 percent of the oats.

Table 18. Acres and annual cost of pastures used by the hog enterprise per farm, per sow and per 100 pounds of pork produced, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Acres per farm	Acres per sow	Cost per farm	Cost per sow
			Dollars	Dollars
Open permanent pasture	14.0	1.66	83.37	9.86
Woodland pasture	17.2	2.04	17.03	2.02
Temporary winter pasture	5.7	.67	174.82	20.69
Total	26.9	4.37	275.22	32.57
Total cost per 100 pounds of pork produced				2.00

Table 19. Replacement cost and annual cost of one mile of fence[1], 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Permanent fence		Temporary fence	
	Quantity	Cost	Quantity	Cost
		Dollars		Dollars
Replacement cost per mile:				
Wire, woven	16 rolls	258.40	16 rolls	258.40
Wire, 4-point barb	8 rolls	78.47		
Staples	50 lbs.	6.00	20 lbs.	2.40
Posts	628	188.40	457	137.10
Labor	250 hrs.	102.50		
Hauling, (Tractor and trailer)	3 hrs.	3.15		
Total		636.92		397.90
Annual cost:				
Depreciation		31.85		29.84
Repairs		27.07		25.36
Interest		15.92		9.95
Labor			240[2] hours	98.40
Power and equipment			4 hours	4.20
Total		74.84		167.75

[1] Erected in the usual manner.

[2] Of this total 160 hours were used in erecting the fence and 80 hours in taking the fence down.

Table 20. Sources of water for the hog enterprise, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Source	Number of farms	Percent of farms
Pond only	23	62
Creek only	2	5
Well only	2	5
Pond and creek	9	25
Pond and spring	1	3
Total	37	100

Table 21. Cost of marketing hogs, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Per farm	Per sow
	Dollars	
Commission fees	50.72	6.00
Hauling	9.45	1.12
Yardage, insurance and weighing	2.28	.27
Total	62.45	7.39
Total cost per 100 pounds of pork produced		.45

Table 22. Miscellaneous cost of the hog enterprise, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Per farm	Per sow
	Dollars	
Veterinary fees and medicine	60.83	7.20
Spray materials and disinfectants	2.92	.35
Taxes	13.69	1.62
Breeding fees	.61	.07
Feed grinding	2.37	.28
Salt	11.50	1.36
Minerals	6.95	.82
Hauling purchased feed	1.12	.13
Auto expense	16.99	2.01
Fencing cost for crops hogged down	54.70	6.47
Other	1.72	.20
Total	173.40	20.51
Total cost per 100 pounds of pork produced		1.26

Table 23. Hours required and cost per acre for performing specified operations, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Hours per acre	Total cost per acre[1]
		Dollars
Disking	.6	1.05
Breaking	1.4	2.30
Harrowing	.4	.58
Cultipacking	.4	.66
Fertilizing	.5	.94
Seeding	.5	.94
Cultivating	.6	.91
Mowing	.6	1.30

[1] Simple average of annual cost figures.

Table 24. Seed and fertilizer prices per hundredweight, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Cost per cwt.[1]	Item	Cost per cwt.[1]
	Dollars		Dollars
Seed:		Fertilizer:	
Bahia grass	72.00	Nitrate of soda	3.34
Alfalfa	53.50	Sulfate of ammonia	3.30
Crimson clover (hardseed)	60.00	Ammonium nitrate	3.88
Crimson clover (softseed)	26.50	Phosphate (18%)	1.30
Dallis grass	75.00	Phosphate (20%)	1.45
Fescue	73.00	Potash (50%)	2.81
Lespedeza, common	38.00	Potash (60%)	3.28
Lespedeza, Kobe	16.38	Basic slag	.74
Lespedeza, Korean	10.12	Lime	.28
Oats	5.86	0-10-20	2.50
Ryegrass	13.00	6-8-8	2.40
Red clover	51.00	5-10-5	2.26
Hairy vetch	20.38	8-8-8	2.63
Ladino clover	173.50		
Lespedeza, sericea	20.50		
Wild winter peas	11.50		
White Dutch clover	94.00		

[1] Simple average of annual prices.

Table 25. Feed prices per hundredweight, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Per hundredweight[1]
	Dollars
Corn (harvested)	2.58
Corn (hogged off)	2.14
Soybeans (harvested)	4.00
Soybeans (hogged off)	3.49
Oats (harvested)	3.27
Oats (hogged off)	2.94
Cottonseed meal	4.43
Soybean meal	4.50
Tankage	6.50
Wheat shorts	4.10
Corn meal	5.38
Fish meal	5.50
Pig and sow ration	5.30
Supplement	6.40
Salt (loose)	1.50
Salt (block)	1.60
Minerals (loose)	7.45
Minerals (block)	6.50

[1] Simple average of annual prices.

Table 26. Prices of miscellaneous items, 37 farms having hog enterprise, Southern Brown Loam, July 1950-June 1952.

Item	Unit of measure	Cost per unit[1]
		Dollars
DDT (Powder)	4 lbs.	2.75
DDT (liquid)	gal.	3.00
Benezene Hexachloride	4 lbs.	1.68
Sulmet	pints	3.30
Automobile	miles	.06
Pickup truck	miles	.06
Truck (1.5 ton)	miles	.10
Wages	hours	.41

[1] Simple average of annual prices.

Table 27. The corn-hog ratio for Mississippi for the period studied compared with the average corn-hog ratio for Mississippi for specified periods.

Period	Average price received for pork[1]	Average price received for corn[2]	Corn-hog ratio
	Dollars	Dollars	
July 1943-June 1953	16.99	1.59	10.68
July 1947-June 1952	19.25	1.55	12.42
July 1950-June 1952	18.94	1.46[3]	12.97

Source: Monthly issues of Agricultural Prices, U. S. D. A.

[1] Simple average of monthly prices.

[2] During the harvesting season (October, November, December).

[3] If the corn-hog ratio during the period studied had been equal to the July 1947-June 1952 corn-hog ratio, the price of corn would have been $1.52 per bushel ($18.94 ÷ 12.42 = $1.52). If the corn-hog ratio during the period studied had been equal to July 1943-June 1953 corn-hog ratio, the price of corn would have been $1.77 per bushel ($18.94 ÷ 10.68 = $1.77).